Site Servicing and Stormwater Management Report 1158 Old Second Line Road Ottawa, Ontario

Type of Document:
Plan of Subdivision Submission

Client:
SLK Limited Partnership

Developer:
Theberge Homes

Project Number:
OTT-00245003-A0

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Date Submitted:
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Legal Notification

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1 Introduction

1.1 Site Description and Proposed Development

SLK Limited Partnership retained EXP Services Inc. (EXP) to undertake a site servicing and stormwater management study in support of a zoning by-law amendment and plan of subdivision application for a proposed development at 1158 Old Second Line Road in the City of Ottawa. The property is situated on Second Line Road, 270m south of Old Carp Road as shown on Figure A1 in Appendix A.

The existing property consists of two (2) parcels. The northern parcel (PIN 045261418) consists of Parts 1 & 2 on Plan 4R-26462, whereas the southern parcel (PIN 045260207) consists of Parts 1 & 2 on Plan 5R-1175 and Part 1 on Plan 5R-8154. The two parcels combine for a total of 1.229 hectares, of which, a 0.029-hectare portion along Second Line Road will be reserved for a 3.0m road widening. The total site area being developed will be 1.20 hectares.

The development is comprised of one hundred (100) 3.5 storey stacked units. The 1.20-hectare development being proposed by SLK Limited Partnership will consist of seven (7) 3.5 storey stacked unit blocks ranging from 10 to 14 units each, a private roadway with adjacent parking stalls and a shared amenity space. The proposed site is bounded to the south and north by Phases 11 & 12D of the Morgan's Grant Development respectively, to the west by Old Second Line Road, and east by City of Ottawa owned land which is subject to an easement in favor of Hydro One.

A private roadway is proposed with one connection onto Old Second Line Road. All utilities will be located within the common roadway block. Sanitary and storm sewers and water infrastructure will require an 11m easement extending north from the site to Goward Drive and a 6m easement southerly to Whernside Terrace is required for a second watermain connection.

This report will discuss the adequacy of the adjacent municipal storm sewers, sanitary sewers and watermains to convey the storm runoff, sewage flows and provide the water demands that will result from the proposed development. It will identify any sanitary, storm or watermain servicing requirements, and provide a design brief for submission, along with the engineering drawings, for City of Ottawa approval.

1.2 Background Documents

Various design guidelines were referred to in preparing the current report including:

- Sewer Design Guidelines, Second Edition, Document SDG002, October 2012, City of Ottawa including:
- Technical Bulletin ISDTB-2012-4 (20 June 2012)
- Technical Bulletin ISDTB-2014-01 (05 February 2014)
- Technical Bulletin PIEDTB-2016-01 (September 6, 2016)
- Technical Bulletin ISDTB-2018-01 (21 March 2018)
- Technical Bulletin ISDTB-2018-04 (27 June 2018)
- Ottawa Design Guidelines – Water Distribution, July 2010 (WDG001), including:
- Technical Bulletin ISDTB-2014-02 (27 May 2014)
- Technical Bulletin ISTB-2018-02 (21 March 2018)

- Technical Bulletin ISTB-2021-03 (18th August 2021)
- Ontario Ministry of Transportation (MTO) Drainage Manual, 1995-1997
- Stormwater Management Planning and Design Manual, Ontario Ministry of the Environment and Climate Change, March 2003 (SMPDM)
- Design Guidelines for Drinking-Water Systems, Ontario Ministry of the Environment and Climate Change, 2008 (GDWS)
- Fire Underwriters Survey, Water Supply for Public Fire Protection (FUS), 2020
- Ontario Building Code 2012, Ministry of Municipal Affairs and Housing.

As the proposed site is within the Morgan's Grant Development, various Master Servicing and Stormwater Management Reports were reviewed in preparation of this report. The following reports, which were provided by City staff, are identified below:

- Master Servicing Study for the Morgan's; Grant Subdivision. J.L. Richards & Associates Limited, February 2001. City Report No: R-2168.
- Morgan's Grant Subdivision, Phase 12D Stormwater Management Report, J.L. Richards & Associates Limited, Sept 22, 2005. City Report No: R-1591-B.
- Morgan's Grant, Phase 12D Subdivision, Stormwater Site Management Plan, J.L. Richards & Associates Limited, August 2005. City Report No: R-1591-A.

The first document above provides the sanitary and storm sewer designs for Phases 1 – 9 of Morgan's Grant along with lands west of the Hydro Corridor and east of Old Second Line Road. This Master Servicing Study also makes an allowance for sanitary flows from Phases 12A-12D, which includes the proposed 1.2-hectare property at 1158 Second Line Road.

The second and third document noted above, provide stormwater design information specifically for the latest Phase of Morgan's Grant (Phase 12D), however the documents include background information for all Phase 12 stages (12A – 12D), since the entire Phase 12 area is serviced by a downstream stormwater management facility.

Additional information on the sanitary, storm and water system designs taken from each noted report, is provided in subsequent sections of this report.

1.3 Existing Infrastructure

The current 1.2-hectare site contains a single-family home that is serviced by a groundwater well and a septic tank and tile field bed. The septic tank and tile field is located between the building and Second Line Road, and a drilled well is located behind the home. The site is almost entirely sloped towards the hydro corridor; however, with a small percentage of the site sloped to Second Line Road. Runoff to Second Line Road is collected and conveyed in the existing roadside ditch.

There are no available municipal services located within Second Line Road (except for a 300mm sewage forcemain servicing Carp). As the site topography slopes easterly to the Hydro corridor with an almost ±4m grade change, the services will be required to connect to the municipal sanitary, storm and water infrastructure within Goward Drive. In addition, a second watermain connection within Whernside Terrace is necessary. Additional information on the water supply requirements is provided later in this report.

An 11.0m wide easement from the site to Goward Drive will be required for the proposed 200mm sanitary sewer, 450mm storm sewer and 200mm watermain. The second 6.0-metre-wide easement extending south towards Whernside Terrace will be necessary for a 200mm watermain. These easements are in accordance with 3.3.1.2 of the City of Ottawa Sewer Design Guidelines, and 3.3.1.2 of the City of Ottawa Water Distribution Design Guidelines.

1.4 Consultation and Permits

Consultation meetings were held between SLK Limited Partnership and the City of Ottawa prior to design commencement. These meetings outlined the submission requirements and provided information to assist with the development proposal.

The storm and sanitary sewers will require Environmental Compliance Approvals (ECA's), filed through a direct submission with the MECP. The following summarizes the anticipated Environment Compliance Approvals (ECA's) required by the Ministry of Conservation and Parks (MECP), formerly the Ministry of the Environment and Climate Change (MOECC):

- Municipal and Private Sewage Works for **Sanitary and Storm Sewers**.
- Municipal and Private Sewage Works for the establishment of the **Stormwater Management Works** (SWM) which will include the onsite flow control methods and associated stormwater detention.

Prior to completion of the ECA application, City signoff on the infrastructure design will be necessary.

The proposed site is located within the Mississippi Valley Conservation Authority (MVCA) jurisdiction, therefore signoff from the MVCA will be required prior to subdivision and ECA approval. As the proposed site is located within the catchment area tributary to the Morgan's grant SWM Facility (City SWMF-1227), no additional onsite quality control requirements are expected.

2 Geotechnical Considerations

A geotechnical investigation was completed by EXP Services Inc, on April 12, 2018, and was prepared to establish the subsurface and groundwater conditions onsite, and to provide and discuss excavation, dewatering, and backfilling requirements. It also provides grade-raise, pavement and foundation design requirements.

In general, the site is treed and contains 150mm to 300mm of topsoil overlaid with sandy silt and silty sand. Below the ground surface, rock refusal depth varied between 0.3m to 1.7m, based on eleven (11) test pits and boreholes.

A maximum grade raise requirement of 2.0m was established for the site.

An additional geotechnical investigation was completed on January 2020, following the tree clearing to establish additional rock elevations with the site. This information has been added to the engineering drawings. The additional test pit investigation was completed to provide additional information on the depth to rock. An Additional Test Pit Investigation letter dated March 20, 2020, was prepared for the additional thirty-four (34) test pits excavated onsite. A June 9, 2023, letter confirmed these two reports remain valid for the proposed development.

3 Watermain Servicing

3.1 Methodology

The water distribution system proposed for this development is designed in accordance with the City of Ottawa Design Guidelines (July 2010). The following steps indicate the basic methodology that was used in the hydraulic analysis:

- A water distribution model was created by adding junction nodes at intersections and creating watermains between the junctions.
- For each junction node the water demand was determined based on the number of contributing homes and the corresponding population.
- The water consumption rates were calculated for the maximum day and maximum hour conditions.
- Hydraulic boundary conditions were set from the information obtained from the City of Ottawa.
- The required fire flow was determined, and
- The proposed water distribution model was simulated in and the results compared with the City of Ottawa criteria.

3.2 Design Criteria

A summary of design parameters used in the water distribution model were taken from Section 4.0 of the City's Guidelines, and are as follows:

- Population Density (2-bedroom apartment) 2.1 person/unit
- Average daily water consumption (Residential) 280 L/cap/day
- Maximum Day Factor (2.5 x Avg. Day)
- Maximum Hour Factor (2.2 x Max. Day)
- C factor (200 mm – 300 mm) 110
- Minimum Allowable Pressure 275 kPa (40 psi)
- Maximum Allowable Pressure 690 kPa (100 psi)
- Minimum Static Pressure (Under Fire Flow Conditions) 140 kPa (20 psi)

3.3 Water Demands

The domestic water demands are estimated below, utilizing parameters from the SDG002 and the GDWS. The following summarizes the parameters used.

Population:

- 100 - 2 Bedroom Apartment x 2.1 person/unit = 210 persons
- Average daily water consumption = 280 L/person/day

- Maximum Day Factor = 2.5 x Avg. Day
- Maximum Hour Factor = 2.2 x Max. Day

The average, maximum day and peak hour domestic (residential) demands for the building are as follows:

- Average Day = 280 x 210 / 86,400 = 0.68 L/sec
- Maximum Day = 2.5 x 0.68 = 1.70 L/sec
- Peak Hour = 2.2 x 1.70 = 3.74 L/sec

Detailed calculations of the domestic water demands are provided in Table B1 of Appendix B.

3.4 Fire Flow Requirements

Water for fire protection will be available utilizing the proposed fire hydrants located along the proposed private roadway. The required fire flows for the proposed site were calculated based on typical values as established by the Fire Underwriters Survey 2020 (FUS). The fire flow requirements were calculated for all blocks. It was determined the required fire flows range from 100 L/sec (6,000 L/min) to 117 L/sec (7,000 L/min).

The following equation from the Fire Underwriters document “Water Supply for Public Fire Protection”, 2020, was used for calculation of the on-site supply rates required to be supplied by the hydrants:

$F = 200 * C * \sqrt{(A)}$

where

F = Required Fire flow in Litres per minute
C = Coefficient related to type of Construction
A = Total Floor Area in square metres

A reduction for low hazard occupancy of -15% for residential dwellings, and an increase for fire area exposure ranging from +26% (min) to +60% (max) was used. Below is a sample calculation of the fire flow requirements for Block 4 (the most critical) residential building.

Required Fire Flow Calculation for Block 4

Type of Construction	= Wood Frame
Coeff Related to Construction	= 1.5
Ground Floor Area	= 117 m^2
Number of Floors	= 4
Fire Flow Requirement, FF	= 200 * 1.5 * √ (A) = 200 * 1.5 * √ (117 * 4) = 7,126 L/min or 7,000 L/min (rounded)
Occupancy Class	= Limited Combustible
Occupancy Charge	= -15%
Fire Flow Requirement, FF	= 7,000 *-15%

	= -1,050 L/min = 5,950 L/min
Sprinkler Protection Credit	= 0%
Charges Due to Exposures	= sum for all sides = 0% + 2% + 0% + 22% = 24%
Required Fire Flow (RFF) = 9,350* (+72%)	= 5,950 L/min + 1,428 L/min = 7,378 L/min = 7,000 L/min (rounded to closest 1,000) = 117 L/sec

The following table summarizes the required fire flows for each residential townhome block.

Table 3-1: Summary of Calculated Fire Flow for Each Block

Apartment Block #	Calculated Fire Flow (L/sec)
Block 1	100
Block 2	117
Block 3	117
Block 4	117
Block 5	117
Block 6	117
Block 7	117
Block 8	117

The fire flow requirements for all proposed buildings range from **100 L/sec (6,000 L/min)** to **117 L/sec (7,000 L/min)** based on the FUS. Please refer to tables in Appendix B for detailed calculations using the FUS.

3.5 Boundary Conditions

Boundary conditions were provided for modelling purposes. Bentley OpenFlows WaterGEMS (CONNECT Edition Update 3) modelling software was used to simulate pressures and flows under maximum day plus fire flow and peak hour conditions.

Boundary conditions were obtained from City of Ottawa personnel for hydraulic modeling. Boundary conditions were used for the connection points at either Connection Location # 1 on Goward Drive (J-100) or Connection Location # 2 (J-175) on Whernside Terrace. Refer to Appendix I for the boundary system information provided by City of Ottawa staff. As the City did not provide an HGL boundary condition during maximum day demands that could be used during a fire flow analysis, an HGL at the maximum day demand of 3.0 L/sec was interpolated from the City's provided data.

Table 3-2: Boundary Conditions Provided by City of Ottawa

Condition	HGL in metres (psi) at Location #1 on Goward Drive	HGL (m) at Location #2 on Whernside Terrace
Max HGL	150.9m (70.7 psi)	150.9m (70.7 psi)
Max Day (at 2.9 L/sec)	*147.3m (65.6 psi)	*147.9m (66.5 psi)
Peak Hour (at 4.5 L/sec)	140.2m (55.5 psi)	142.0m (58.1 psi)
Max Day plus FF (at 8,000 L/min)	123.8 m (32.2 psi)	124.9 m (33.7 psi)
Max Day plus FF (at 9,000 L/min)	119.5m (26.1 psi)	120.8m (27.9 psi)
Max Day plus FF (at 10,000 L/min)	118.3m (24.1 psi)	119.8m (26.5 psi)
Note: The HGL at a maximum day demand of 3.0 L/sec was interpolated for use in the fire flow analysis.		

3.6 Modelling Results

The results of the modelling under the peak hourly condition based on the boundary condition at Location #1, is summarized in Table 3-3 below. Results for both locations #1 and # 2 are included in Appendix D.

Table 3-3: Summary of Results for Peak Hour (Boundary Location #1)

Label	Demand (L/s)	Elevation (m)	Hydraulic Grade (m)	Pressure (psi)
J-100	0.00	100.76	140.24	56
J-105	0.42	101.19	140.24	55
J-106	0.48	101.19	140.23	55
J-110	0.00	101.70	140.23	55
J-115	0.52	102.60	140.23	53
J-120	1.05	103.00	140.23	53
J-125	0.37	103.40	140.23	52
J-130	0.00	103.90	140.23	52
J-135	0.45	104.20	140.23	51
J-140	0.00	103.50	140.23	52
J-145	0.45	102.60	140.23	53
J-150	0.00	102.60	140.23	53
J-155	0.37	102.50	140.23	54
J-160	0.00	102.60	140.23	53
J-165	0.00	101.70	140.23	55
J-170	0.00	101.19	140.24	55
J-175	0.00	101.19	140.24	55
J-180	0.52	103.50	139.88	52
J-185	0.00	101.19	140.24	55

Table 3-4: Summary Results for Maximum Day Plus Fire Flow (Boundary Location #1)

Hydrant Label	Fire Flow (Needed), (L/sec)	Modeled Flow (L/sec)
J-125	117.0	126.4
J-135	117.0	123.2
J-145	117.0	128.1
J-155	117.0	131.6

The modeled minimum and maximum working pressures anticipated within the development are 51 psi and 56 psi under peak hour conditions. And modeled available fire flows under the maximum day demand conditions range from 123.2 L/sec to 131.6 L/sec.

3.7 Water Age Analysis

A review of the age of the water within the proposed system was completed to ensure than an appropriate size of watermain was selected, which was not unnecessarily oversized. The maximum residence time was estimated based on volume of water within the private system between the connection point on Goward Drive and the property boundary of the proposed site. It was assumed that the most conservative approach was to estimate the total volume of water within the water system assuming a dead-ended system. This analysis assumed the entire site at 1158 Second Line Road would be feed from the connection point at Goward Drive. This is a conservative approach, as in reality water would be feed from both connection (Goward and Whernside Terrace). The following summarizes the watermain lengths, and volumes used in this analysis:

Total length of 200mm watermains = 341 m
Total length of 38mm watermain services = 31 m
Total length of 25mm watermain services = 400 m (50 services at 8m avg. length each)

Volume of water within all watermains/services = 10.86 m^3 or 10,861 litres

Using the demands in Table B1, the time required for full exhaustion of the 10.9 m^3 of water was calculated based on the demands noted in Table B1. In addition, the minimum night demand of 0.068 L/sec was calculated using MOECC Table 3.3 with a minimum peaking factor of 0.10. The following water age estimates are provided in Table 4-6 below.

Table 3-5: Water Age Results

Demand Condition	Demand (L/sec)	Time Required for Full Water Volume Turnover (hours)
Minimum Night	0.068	44.4
Average Day	0.68	4.3
Maximum Day	1.70	1.7
Peak Hour	3.74	0.8

Although a time of 44.4 hours (was calculated based on a minimum demand of 0.068 L/sec), it should be noted that this demand rate would apply only during an 8-hour nighttime period. After the 8-hour nighttime period, an average rate of 0.68 L/sec would apply during the 16-hour daytime. Based on this, the time required for the full exhaustion of 10.9 m^3, would approximately 8.0+3.6 = 11.6 hours.

Similarly, there are 15 existing single-family homes on Goward Drive that are located west of the proposed connection point. For this 200mm diameter watermain, the estimated volume is 3.9 m^3 based on 10.0m long 19mm diameter services and 123m of 200mm watermain. The time required for the full exhaustion of 3.9 m^3, at a minimum night and average day demands of 0.017 and 0.17 L/sec respectively would be approximately 8.0+5.6 = 13.6 hours.

Therefore, the age of the water within the proposed development is expected to be similar to that of the adjacent existing subdivision.

4 Sanitary Sewer Design

4.1 Design Criteria

The sewage flows were calculated using City of Ottawa design criteria as follows:

- Unit Density (2-bedroom apartment) =2.1 person/unit
- Average Residential Flow Allowance = 280 L/person/day
- Peaking Factor (Harmon Formula) =1 + 14 / (4 + (P/1000)$^{0.5}$) * K
- Correction Factor, K = 0.8
- Full Flow Velocity = 0.60 m/sec to 3.0 m/sec
- Extraneous Flow Allowance = 0.33 L/ha/sec

4.2 Proposed Sanitary Servicing

The sanitary sewer system is designed based on a population flow, and an area-based infiltration allowance. Using the above noted design criteria for the sanitary sewers, the sewage flows were calculated as follows:

Population:

No of Units:	= 100
Unit Type:	= 2-bedroom apartment
Unit Density	= 2.1 person/unit
100-2-bedroom apartment x 2.1 person/unit	= 210 persons

Sanitary Flow

Average Residential Flow Allowance	= 280 L/person/day
Correction Factor, K	= 0.8
Peak Factor = 1 + 14 / (4 + (126.9/1000)$^{0.5}$) * K	= 3.51
Avg. Domestic Flow = 210 x 280 L/person/day x (1/86,400 sec/day)	= 0.68 L/sec
Peak Domestic Flow = 0.68 L/sec x 3.51	= 2.39 L/sec

Extraneous Flows

Extraneous Flow Allowance	= 0.33 L/ha/sec
Q Infiltration = 0.33 L/ha/sec x 1.228 ha	= 0.41 L/sec

Total Sewage Flow

Total Sanitary Flow = 2.39 + 0.40	**= 2.79 L/sec**

The estimated peak sanitary flow rate from the proposed property is **2.79 L/sec** based on City of Ottawa Design Guidelines.

The permitted flow velocities within the sanitary sewer system range between 0.60 m/sec and 3.0 m/sec under full-flow conditions. All new sanitary sewers within the proposed site development will be 200mm in diameter therefore a sewer slope of 0.32% is necessary to meet the minimum velocity requirement of 0.60 m/sec. Similarly, the maximum permitted slope of a 200mm sanitary sewer would be 8.1% to meet the maximum 3.0 m/sec full-flow velocity.

A sanitary sewer design sheet was prepared to confirm the sanitary sewer pipe diameters and full-flow velocities. The selected pipe slopes range from between 0.40% and 2.43%, having full flow velocities in the range of 0.66 m/sec to 1.62 m/sec. The capacities of the sanitary sewers would therefore be between 21.1 L/sec and 51.9 L/sec.

4.3 Downstream Sanitary Sewer System

The proposed sanitary sewer within the development site will discharge to a 200mm sanitary sewer on Goward Drive. This sanitary sewer was installed during the development of Phase 12D of Morgan's Grant Subdivision. The development at 1158 Second Line Road falls within Phase 12 of this subdivision.

A review of the sanitary sewer design provided in the Master Servicing Study, indicated that the original sanitary drainage area and sewage parameters for Phase 12 were based on the following:

Original Morgan's Grant Phase 12 Sanitary Design

Area	= 27.0 ha
Residential Density	= 4.0 person/unit
Population	= 496 persons
Average Residential Flow Allowance	= 350 L/person/day
Institution Flow Allowance	= 50,000 L/ha/fay
Residential Peaking Factor	= Harmon Formula
Institutional Peaking Factor	= 1.5

In Appendix B of the Master Servicing Study a sanitary sewer design sheet identifies a total peak flow from Phase 12 of 35.4 L/sec. The sanitary sewer design sheet from the MSS is provided in Appendix I, with the specific rows highlighted.

To confirm adequate capacity is available in the downstream system a review of the as-constructed conditions was completed and the peak sewage rates were re-calculated based on current City Guidelines.

Figure A5 in Appendix A illustrates Phase 12 area of Morgan's Grant. It consists of residential, institutional and open space uses. Using the City of Ottawa's urban building GIS layer, it was determined that Phase 12 contains 241 single family, 47 townhomes, and one school. The entire area is 27.9 hectares and is made up of 2.90 hectares of institutional, 2.74 hectares of open space, with the remaining 21.13 hectares being residential / municipal roadways.

The sewage flows for Morgan's Grant Phase 12, based on current City Guidelines were re-calculated as follows:

2-bedroom Apartment Unit	= 100
Single Family Homes	= 241
Unit Density (2-bedroom apartment)	= 2.1 person/unit

Unit Density (Single Family Homes)	= 3.4 person/unit
100-2 bedroom apartment x 2.1 person/unit	= 210 persons
241-Single Units x 3.4 person/unit	= 819.4 persons
Residential Population = 126.9 + 819.4	= 1029.4 persons

Residential Sewage Flow

Residential Flow Allowance	= 280 L/person/day
Correction Factor, K	= 0.8
Peak Factor = $1 + (14 / (4 + (P/1000)^{0.5})) * K$	
Peak Factor = $1 + (14 / (4 + (1029.4/1000)^{0.5})) * 0.8$	
Peak Factor = 1 + (2.79) * 0.8	= 3.23
Avg. Domestic Flow = 1029.4 x 280 L/person/day x (1/86,400 sec/day)	= 3.34 L/sec
Peak Domestic Flow = 3.34 L/sec x 3.23	= 10.78 L/sec

Institutional Sewage Flow

Institutional Flow Allowance	= 28,000 L/day/ha
Institutional Peaking Factor	= 1.5
Peak Institutional Flow = 28,000 x 2.9 x (1/86,400 sec/day) x 1.5	= 1.41 L/sec

Extraneous Flows

Total Area	= 27.97 hectares
Extraneous Flow Allowance	= 0.33 L/ha/sec
Extraneous Flows = (0.33 x 27.97)	= 9.23 L/sec

Total Sewage Flow

Total Sanitary Flow = 10.78 + 1.41 + 9.23	= 21.42 L/sec

The re-calculated peak sewage flows under fully developed conditions for the Phase 12 Morgan's Grant subdivision is calculated to be 21.42 L/sec, which includes 2.79 L/sec sewage flow from the proposed 100-unit (2-bedroom apartment) development at 1158 Second Line Road. It should be noted that the original design was completed based on a higher average wastewater flow allowance. The City of Ottawa's residential flow allowance is now 280 L/person/day as per Technical Bulletin ISTB-2018-01. Therefore, the existing infrastructure is conservatively designed in accordance with today's standard guidelines. It can be concluded that the existing sanitary sewer infrastructure in Morgan's Grants Phase 12 subdivision will be adequate to service the additional peak sanitary flows from the 1158 Second Line Road development.

5 Stormwater Management

5.1 Design Criteria

The stormwater system was designed in conformance with the latest version of the City of Ottawa Design Guidelines (October 2012). Section 5 "Storm and Combined Sewer Design", and Section 8 "Stormwater Management" from the design manual were referenced.

5.1.1 Minor System Design Criteria

- The storm sewers have been designed and sized based on the Rational Method and the Manning's Equation under free flow conditions for the 2-year storm using a 10-minute inlet time.
- Inflow rates into the minor system are limited to 100 L/sec, based on the capture rate established for this site as per the Stormwater Site Management Plan for Morgan's Grant Phase 12D. The design assumed five (5) inlets at 20 L/sec per inlet.
- The storm sewer within the Morgan's Grant Subdivision were designed as a minor (pipe) and major drainage (overland) system, or a dual drainage concept. The minor system was designed to convey runoff based on the 5-year storm under free-flow conditions. Inlet control devices (ICD's) are used within the Morgan's Grant Subdivision to limit the capture rate to the minor system.
- Hydraulic Grade Line (HGL) Analysis within the Morgan's Grant Subdivision was prepared based on the 100-year City of Ottawa IDF parameters. The HGL analysis was based on 100-year captured flows.

5.1.2 Major System Design Criteria

- Rear yard ponding is permitted as per City of Ottawa Guidelines, up to a maximum of 300mm in depth, however the volume cannot be accounted for.
- The maximum permitted 100-year ponding depth on the private streets is 350mm.
- The product of the depth of flow x velocity must be less than 0.6 m/sec under the 100-year storm as per City Guidelines.
- Overland Flow is permitted to be discharged to the Hydro corridor, with not more than 126 m^3 of runoff from the proposed site, as per the Morgan's Grant, Phase 12D SWM report.
- The major system (roadway) has been designed to convey surface runoff easterly to the Hydro One corridor.
- A minimum of 150mm of vertical clearance must be provided between the spill elevation on the street and the ground elevation at the building.
-

5.2 Runoff Coefficients

The average runoff coefficient for the overall site area under post-development conditions was calculated as 0.67, whereas the pre-development average runoff coefficient was less than 0.10.

5.3 Calculation of Allowable Release Rate

To control runoff from the site it will be necessary to limit post-development flows to the allowable capture based on previous Morgan's Grant, Phase 12D design.

The allowable release rate from the site was set just below the design peak flow rate for the minor system. From the original storm design sheet, the storm sewer was sized based on a 5-year level of service with a runoff coefficient of 0.50 and a time of concentration of 20 minutes. The following parameters will be used to determine the allowable release rates from the proposed site to the existing sewer on Goward Drive, using the Rational Formula.

$Q_{ALL} = 2.78\ C\ I\ A$

where:

Q_{ALL}	=	Peak Discharge (L/sec)
C	=	Runoff Coefficient (C=0.50)
I	=	Average Rainfall Intensity for return period (70.25 mm/hr)
	=	$732.951/(Tc+6.199)^{0.810}$ (5-year)
Tc	=	Time of concentration (20 mins)
A	=	Drainage Area (1.20 hectares)

$Q_{ALL} = 2.78 * C * I * A$
$Q_{ALL} = 2.78 * 0.50 * 70.25 * 1.20$
$Q_{ALL} = 117.2$ L/sec

The peak design flow, based on the 5-year storm, was estimated at 117.2 L/sec. This peak storm flow was taken from the third row of the original storm design sheet for the Morgan's Grant Phase 12D, and is attached for reference in Appendix I.

Although the storm sewer system was based on this peak flow, 100 L/sec (or 5 inlets at 20 L/sec/inlet) was used as the minor system capture rate. Since the captured rate of 100 L/sec was used in the Hydraulic Grade Line Analysis for the downstream storm sewers in Morgan's Grant, the allowable discharge rate to the storm sewer system from the site was limited to 100 L/sec. Runoff in excess of the 100 L/sec capture rate will be detained onsite within underground stormwater storage chambers or will overflow and be stored within the Hydro corridor.

5.4 Pre-Development Conditions

The proposed site is 1.2 hectares in area and is currently undeveloped, except for a single residential home. This home will be demolished for re-development of the site. The topography of the site is generally in an easterly direction, however a small area along Second Line flows westerly towards this roadway. A pre-development drainage plan for the site was prepared using PCSWMM. The watershed delineation routine was used to establish the catchment areas, based on the Digital Raster Acquisition Project of Eastern Ontario (DRAPE) 2m x 2m digital terrain models (DTM). The DTM images were loaded into PCSWMM, and the watershed delineation tool was used to establish overland flow routes and catchments. Engineering drawing C08 illustrates the pre-development catchment for the property, along with the catchment tributary to the culvert at Goward Drive. This catchment was generated to allow for sizing of new culverts under the proposed roadways, and to confirm the allowable discharge rates to Second Line Road. The pre-development runoff coefficient for the site was determined to be 0.23.

Using a time of concentration of 20 minutes and an average runoff coefficient of 0.23, the pre-development release rates from the site were estimated at 40.1 L/sec, 54.2 L/sec and 92.5 L/sec for the 2-year, 5-year and 100-year storms respectively using the Rational Method. Based on drawing C08 the estimated pre-development flows to each outlet (either Second Line Road or Hydro Corridor) are summarized in Table 6-1 below. Runoff rates based on the Rational Method and PCSWMM compare well.

Table 5-1: Summary of Pre-Development Peak Flows from Proposed Site

Outlet Location	100-year Pre-Development Peak Flow (L/sec)	
	Rational Method	3hr Chicago Storm (PCSWMM)
To Second Line Road	7.4	22.9
To Hydro Corridor	85.1	81.8
Totals	92.5	104.7

5.5 Proposed Stormwater System

Due to the re-development of the site the overall post development runoff coefficient will increase over existing conditions. The increase in runoff is due to an increase in imperviousness levels (additional hard surfaces, roof areas and hard landscaping). The post-development average runoff coefficient for the site was calculated as 0.67, based on an average runoff coefficient of 0.20 for grassed areas and 0.90 for hard surfaces.

Stormwater runoff from the proposed site will drain from a combination of controlled and uncontrolled areas.

A post- development storm drainage plan, drawing C09 is prepared for the development with average runoff coefficients calculated for each drainage area. The proposed stormwater works consists of the following elements:

- A storm sewer system to convey the 1:100-year flows to an underground stormwater storage system located beneath the shared amenity space within the development.
- A second storm sewer system to convey the allowable discharge rate to the storm sewer on Goward Drive. This storm sewer system also drains the foundation drains from the stacked units.

There are two uncontrolled drainage areas (U1 and U2). Uncontrolled drainage area U1 is flow discharging to Old Second Line Road right-of-way along the southern side of the property and U2 is flow discharging to Hydro corridor at the northern side of the property.

Table 6-2 provides a summary of the post development peak flows from the site.

Table 5-2: Summary of Post-Development Flows

Return Period Storm	Peak Flows to Goward Drive Storm Sewers (L/sec)		Peak Uncontrolled Flows to Old Second Line Road ROW (L/sec)	Peak Uncontrolled Flows to Hydro Corridor (L/sec)	Total Peak Flows (L/sec)	Allowable Peak Flows (L/sec)
	Uncontrolled	Controlled				
2-year		30.1	2.7	8.5	41.3	117.2
5-year		40.8	3.6	11.5	56.0	
100-year		84.9	7.8	24.7	117.4	

5.6 Flow Attenuation and Storage

As a result of utilizing flow control, attenuation (or storage) of runoff is necessary. This will be achieved utilizing storage in underground chambers. Using the allowable release rates, the Modified Rational Method was used to determine the 2-year, 5-year, 100-year 100-yr + 20% (Climate change) volumes that are necessary for corresponding release rates. It should be noted that the release rates used for the 100-year and Climate Change storm events were set at 50% of the maximum allowable release rate. The maximum release rate of 84.9 L/sec was set, in order to ensure that the summation of all controlled and uncontrolled peak flows discharging (both minor and major system) meet the allowable rate of 117.2 L/sec.

Drainage areas A1 to A4 (0.994 ha) are tributary to proposed underground chambers. The chambers were sized to accommodate the 100-yr plus 20% storm within the chambers, without surface ponding.

The table below provides the volumes necessary to detain the 100-year plus 20% storm, based on 50% of the allowable release rate (taking into account uncontrolled runoff). Error! Reference source not found. summarizes the combined controlled and uncontrolled flows leaving the subject site.

Table 5-3: Summary of Post-Development Storage

Areas	Outlet	Release Rate (L/s)			Storage Required (m3) (MRM)				Storage Provided (m3)				Control Method
		2-yr	5-yr	100-yr	2-yr	5-yr	100-yr	100-yr + 20%	Pipes	Cham-bers	Struc-tures	Total	
A1 to A4	From SWM Chambers	30.1	40.8	84.9	95.9	128.6	372.2	475.8		450		450	IPEX TEMPEST LMF-XX

Table 5-4: Summary of Post-Development Storage

Areas	Outlet	Release Rate (L/s)			Storage Required (m3) (MRM)				Storage Provided (m3)	Control Method
		2-yr	5-yr	100-yr	2-yr	5-yr	100-yr	100-yr + 20%		
A1 to A4	From U/G Chambers	28.4	38.5	84.9	99.0	132.9	379.9	485.3	450	IPEX TEMPEST. 183mm DIA @ 1.48m

5.7 Storm Sewer Design

Average runoff coefficients were calculated for all drainage areas for sizing of the storm sewers. Post-development drainage areas are illustrated on drawing C09. Average runoff coefficients were calculated for each catchment and inlet times of 10 minutes were used as per City of Ottawa Guidelines.

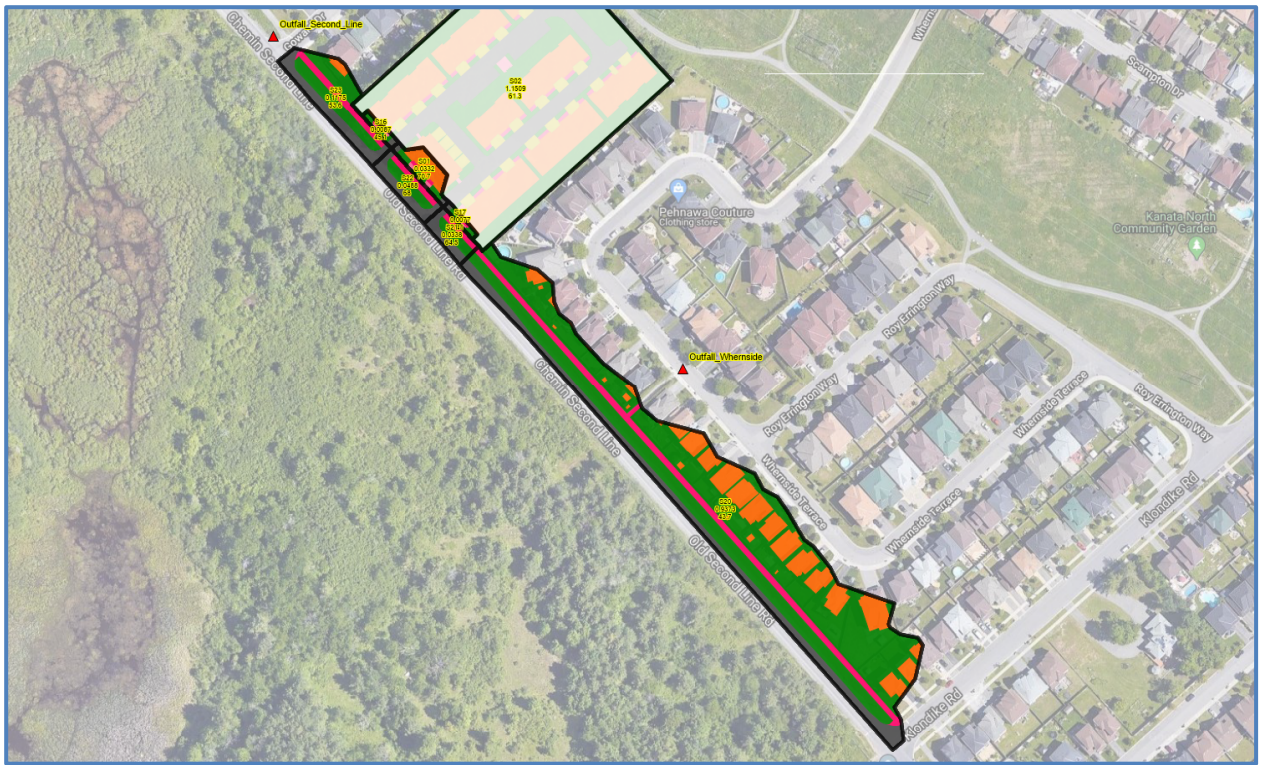
A minimum 600mm diameter storm sewer is proposed for the main line storm sewer capturing surface runoff. All new storm sewers were sized for the 100-year peak flow. Design sheets for the 100-year sizing of the storm sewer system are included in Appendix E. A separate storm design sheet for the foundation s drainage and controlled flows from the underground chambers is also provided in Appendix E.

5.8 Culvert Sizing

The entrance culvert on Second Line Road was designed in accordance with Section 6.4.2 of the City of Ottawa's Design Guidelines, which states culverts shall be a minimum diameter of 500mm. For the culverts crossing these roadways, any culvert greater than 6 metres in length shall be designed for the 50-year return period for local urban roadways. The culvert is 21 metres in length; therefore, the following summarizes the culvert design requirements:

Peak flows in the ditches under a various storm events were calculated using the pre-development subcatchments that were derived in PPCSWMM and adjusted for post-development conditions. Figure 6 below shows the drainage areas tributary to the proposed culverts and the existing culvert crossing Goward street.

Figure 1 – Subcatchments Used for Sizing Entrance Culverts



Upstream of the proposed culverts under Antelope Private, a ditch inlet structure (City # IN58746) is located on the east side of Second Line Road approximately 135 metres south of Antelope Private (south leg). This DICB is equipped with an inlet control device (197mm DIA orifice) with a 300mm outlet pipe discharging to Whernside Terrace storm sewer. The existing ditch south of the subject property is sloped southerly back to the DICB, therefore surface ponding will occur within the ditch. A PCSWMM model was completed to derive peak flows within the east ditch between Klondike Road and Goward Street. Peak flows for the 2yr through 100yr, along with the 100-yr plus 20% and stress test events were run. Existing culvert elevations were taken from documents noted in the Section 1.2. The following summarizes the existing culvert data used.

Culvert Crossing at Goward Street

- U/S Invert = 101.32 m
- D/S Invert = 101.10 m
- Pipe Type = CSP
- Pipe Dia = 400mm

The flowing summarizes the peak flows at three critical locations: 1) Upstream end of proposed 500mm culvert #1 - North leg of Antelope Private, 2) Upstream end of proposed 500mm Culvert #2 - South leg of Antelope Private, and 3) Upstream end of existing 400mm Culvert #3 – crossing Goward Street.

Table 5-5: Peak Flows in East Ditch Along Second Line Road.

Storm Event	[1] Peak Flows at Upstream End of Proposed Culvert at Antelope Private – South Leg (L/sec)	[2] Peak Flows at Upstream End of Proposed Culvert at Antelope Private – North Leg (L/sec)	[3] Peak Flows at Downstream End of Proposed Culvert at Goward Street (L/sec)
Chicago_3h_2yr	6.2	18.6	33.2
Chicago_3h_5yr	10.5	31.7	59.9
Chicago_3h_10yr	12.7	38.4	74.6
Chicago_3h_25yr	29.6	46.7	91.8
Chicago_3h_50yr	117.3	112.6	119.6
Chicago_3h_100yr	149.8	169.0	180.5
Chicago_3h_100yr + 20%	224.5	266.8	298.2
Historic_Jul1-79	43.9	58.6	76.6
Historic_Aug4-88	105.6	66.4	103.1
Historic_Aug8-96	12.9	38.6	73.7

1 - Peak flows at Junction J5 of Conduit C1
2 - Peak flows at Junction J3 of Conduit C2
3 – Peak Flows at Junction J1 of Conduit C3

The 50-year peak flows at proposed Culvert #1, proposed Culvert #2, and existing Culvert #3 were estimated at 117.3 L/sec, 112.6 L/sec and 119.6 L/sec respectively.

Each culvert will convey the 50-year peak flow based on an assumed free boundary condition outfall. Figure 2 below illustrates the HGL within the ditch. One can see that the 50-year and 100-year HGL's are slightly lower than the Historical storm events, however all conveyed within the culverts.

Figure 2 – 50-year and 100-year HGL within East Ditch Along Second Line Road.

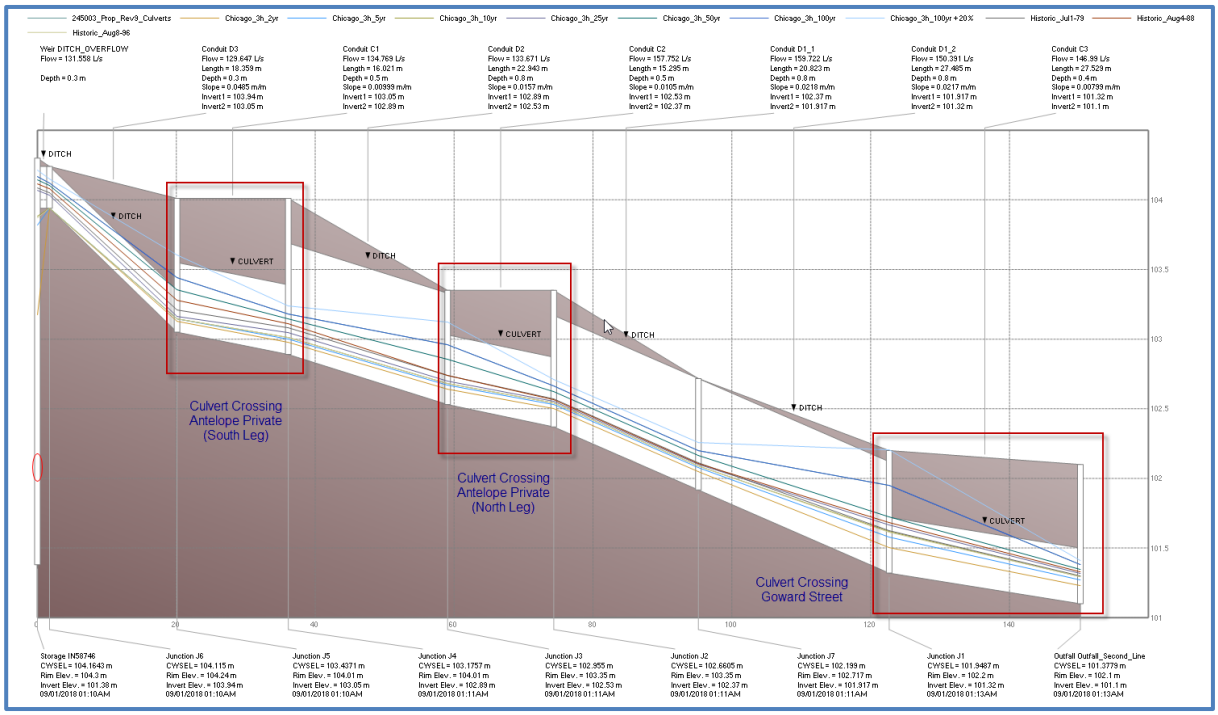
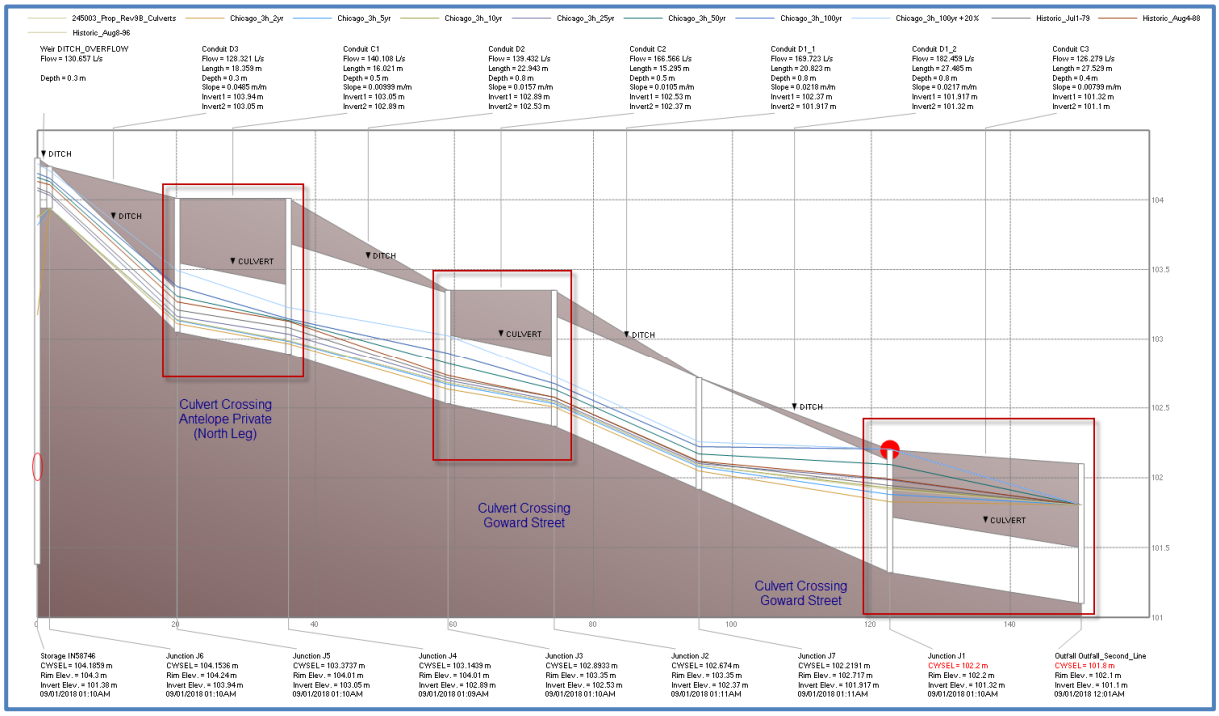


Figure 3 –100-year HGL within East Ditch Using Raised Boundary Condition (0.3m above Obvert)



A secondary review of 100-year HGL within ditch using a fixed outfall of 0.30m above the top of the existing culvert (101.8m) culvert was completed, and illustrated in Figure 3. Even with culvert at Goward Street modelled having a tailwater condition 0.3m above the top of the outlet pipe, the new proposed culverts will have capacity to convey the peak flows. It should be noted that during the stress test event, the anticipated WSEL will be just at the ground surface (for free outlet conditions) and in a spill condition on the upstream end of the culvert crossing Goward Street. This is a typical condition for culverts sized for storm events less that the 100yr plus 20%.

Due to the minimal cover and shallow depth of the existing ditch, the 500mm culverts were selected. It should be noted that the existing culvert crossing the current residential home on the property is only 400mm in diameter and the downstream culvert crossing Goward Street is also a 400mm diameter.

6 Erosion and Sediment Control

During all construction activities, erosion and sedimentation shall be controlled by the following techniques:

- extent of exposed soils shall be limited at any given time,
- exposed areas shall be re-vegetated as soon as possible,
- filter cloth shall be installed between frame and cover of all new catch basins and catch basin manholes,
- filter cloth shall be installed between frame and cover of the existing catch basins and catch basin manholes as identified on the site grading and erosion control plan,
- light duty silt fencing will be used to control runoff around the construction area. Silt fencing locations are identified on the site grading and erosion control plan.
- visual inspection shall be completed daily on sediment control barriers and any damage repaired immediately. Care will be taken to prevent damage during construction operations,
- In some cases barriers may be removed temporarily to accommodate the construction operations. The affected barriers will be reinstated at night when construction is completed,
- Sediment control devices will be cleaned of accumulated silt as required. The deposits will be disposed of as per the requirements of the contract,
- during the course of construction, if the engineer believes that additional prevention methods are required to control erosion and sedimentation, the contractor will install additional silt fences or other methods as required to the satisfaction of the engineer, and
- Construction and maintenance requirements for erosion and sediment controls are to comply with Ontario Provincial Standard Specification (OPSS) OPSS 805, and City of Ottawa specifications.

7 Conclusions

The proposed 1.2-hectare development by Theberge Homes is comprised of one hundred (100), 3.5 storey stacked units. The following summarizes the servicing and stormwater requirements for the site:

- The allowable capture rate from the proposed site was based on the minor system capture rate established as part of the Morgan's Grant Subdivision Phase 12D which was set at 100 L/sec. This capture rate was set just below the 5-year rate for the 1.2-hectare site using a time of concentration of 20 minutes and a runoff coefficient of 0.50, which was calculated at 117.3 L/sec.
- The 100-year pre-development peak flow rate based on the Rational Method was estimated at 7.4 L/sec and 85.1 L/sec to the Second Line ditch and the Hydro Corridor respectively. Dynamic modelling of pre-development flows resulted in peak flows of 27.2 L/sec & 92.7 L/sec for the same storm events.
- Inlet control devices (ICDs) will be used to control runoff to the allowable discharge rate of 88.5 L/sec. The Inlet control devices will be installed storm manhole 206A (80 L/sec) and CB 01 (8.5 L/sec) as shown on the Site Servicing plan and will control peak flows to a maximum 100-year rate of 100 L/sec.
- Underground chambers will be used to store runoff. The 100-year required volume was calculated at 379.9 m^3. Whereas the 100-year +20% volume is 485.3 m^3.
- The proposed development has an estimated peak sewage flow of 2.79 L/sec based on City of Ottawa Guidelines. A new 200mm sewer will be installed with a minimum slope of 0.40% having a full flow capacity of 21.6 L/sec, and full flow velocity of 0.67 m/sec. The sanitary sewer will be connected into the existing municipal sanitary sewer on Goward Drive. A review of the downstream capacity in the sanitary sewers in Morgan's Grant indicate adequate capacity is available.
- A hydraulic water model was developed to determine the pressures available under peak hour and maximum day plus fire flow conditions. Two boundary conditions were provided by City staff for modelling. Two connections to the existing city water distribution system are necessary as there will be more that 50 residential units.
- The calculated minimum and maximum working pressures anticipated within the development is between 51 psi and 56.0 psi under peak hourly conditions. Fire walls are proposed to divide the blocks. The maximum estimated fire flow requirement based on the FUS was calculated at 117 L/sec. townhome block.
- An overland flow route is provided for the major storm event.

Appendix A – Figures

Figure A1: Site Location Plan

Figure A3: Water Model Layout, Boundary Condition #1

Figure A4: Water Model Layout, Boundary Condition #2

Figure A5: Offsite Sanitary Drainage – Morgan's Grant Phase 12

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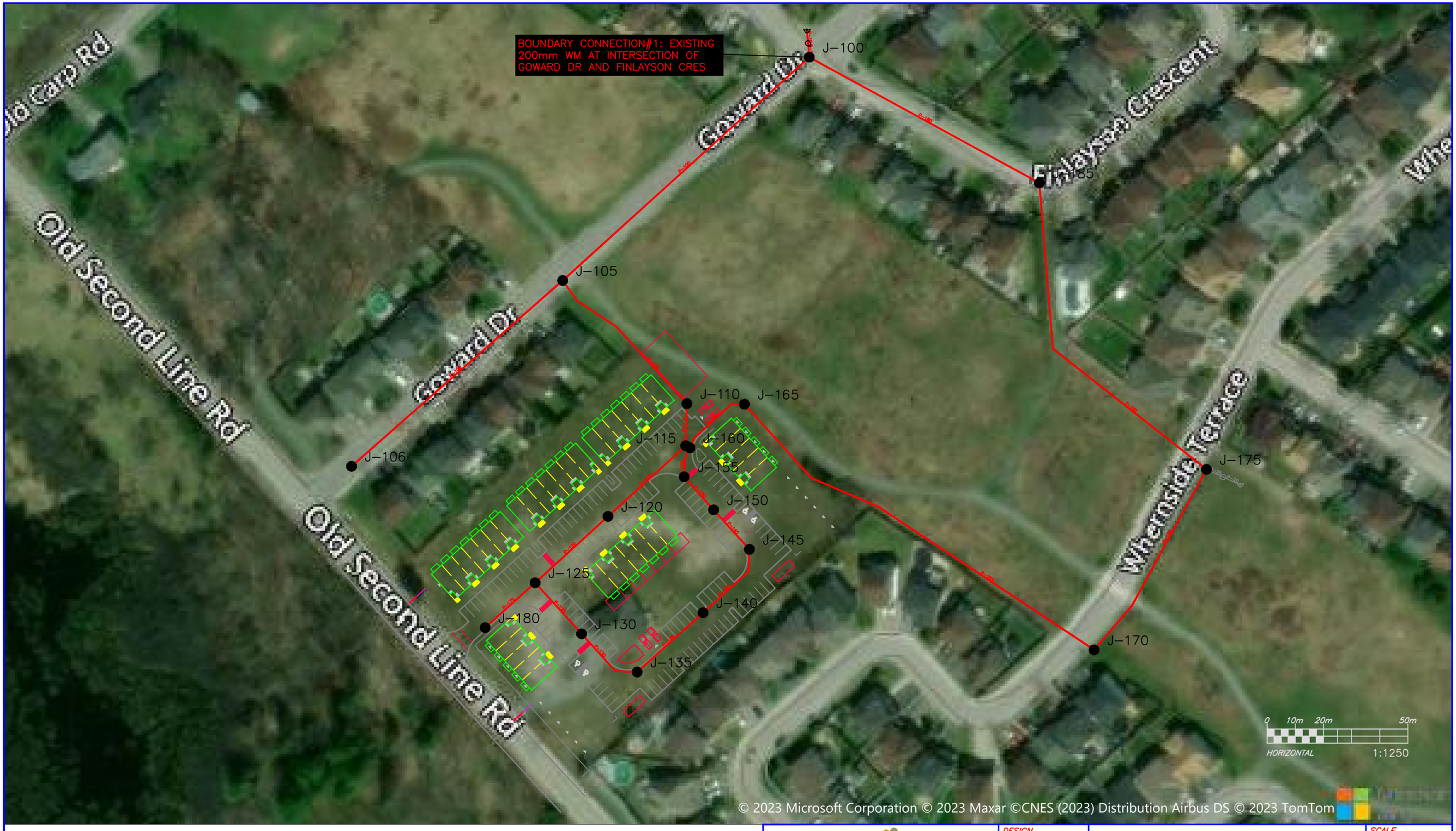
DESIGN JLF	1158 OLD SECOND LINE ROAD THEBERGE HOMES		SCALE 1:10000
DRAWN SAB			SKETCH NO
DATE JAN 2020	SITE LOCATION PLAN		FIG A1
FILE NO 245003			



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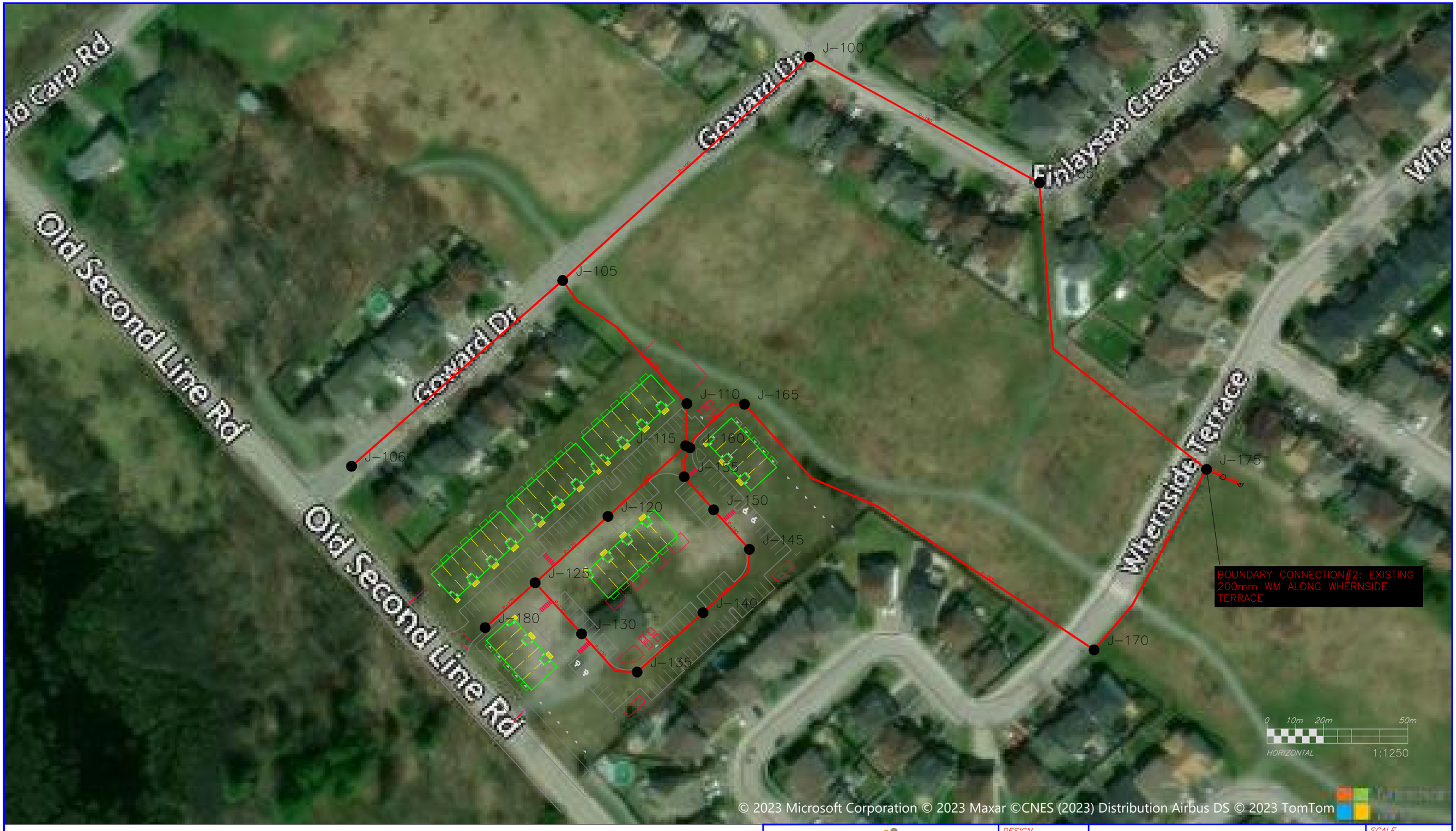
DESIGN	ZP
DRAWN	ZP
DATE	JUNE 2023
FILE NO	245003

1158 OLD SECOND LINE RD
THEBERGE HOMES

WATER MODEL LAYOUT
BOUNDARY CONDITION #1

SCALE 1:1250

SKETCH NO FIG A3



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DRAWN	ZP
DATE	JUNE 2023
FILE NO	245003

1158 OLD SECOND LINE RD
THEBERGE HOMES

WATER MODEL LAYOUT
BOUNDARY CONDITION #2

SCALE 1:1250

SKETCH NO FIG A4

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DRAWN	SAB
DATE	JAN 2020
FILE NO	245003

1158 OLD SECOND LINE ROAD
THEBERGE HOMES

OFFSITE SANITARY DRIANAGE
MORGAN'S GRANT PHASE 12

SCALE 1:4000

FIGURE NO FIG A5

Appendix B – Water Tables

Table B1: Water Demand Chart

Table B2: Summary of Required Fire Flows (RFFs)

Table B3: to B27 Calculation of Fire Flow Requirements for Buildings

TABLE B1
WATER DEMAND CHART

Location: 1158 Old Second Line
Project No: OTT-00245003
Designed by: Z. Pan
Checked By: B. Thomas
Date Revised: June 08, 2023

Water Consumption
Residential = **280** L/cap/day

Population Densities

Single Family	3.4	person/unit
Semi-Detahced	2.7	person/unit
Duplex	2.3	person/unit
Townhome (Row)	2.7	person/unit
Bachelor Apartment	1.4	person/unit
1 Bedroom Apartment	1.4	person/unit
2 Bedroom Apartment	2.1	person/unit
3 Bedroom Apartment	3.1	person/unit
Avg. Aptartment	1.8	person/unit

	No. of Units										Demands in (L/sec)					
	Singles/Semis/Towns				Apartments							Maximum Demand (L/day)	Peak Hourly Demand (L/day)			
Junction	Single Familty	Semi-Detached	Duplexz	Townhome	Bachelor	1 Bedroom	2 Bedroom	4 Bedroom	Avg Apt.	Total Persons (pop)	Average Demand (L/day)	2.50 x Avg Day	2.20 x Max Day	Avg Day (L/s)	Max Day (L/s)	Max Hour (L/s)
Proposed Buildings																
J-115							14			29.4	8232	20,580	45,276	0.10	0.24	0.52
J-120							28			58.8	16464	41,160	90,552	0.19	0.48	1.05
J-125							10			21.0	5880	14,700	32,340	0.07	0.17	0.37
J-135							12			25.2	7056	17,640	38,808	0.08	0.20	0.45
J-145							12			25.2	7056	17,640	38,808	0.08	0.20	0.45
J-155							10			21.0	5880	14,700	32,340	0.07	0.17	0.37
J-180							14			29.4	8232	20,580	45,276	0.10	0.24	0.52
Subtotal							100			210.0	58,800	147,000	323,400	0.68	1.70	3.74
Existing Homes																
J-105	7									23.8	6664	16,660	36,652	0.08	0.19	0.42
J-106	8									27.2	7616	19,040	41,888	0.09	0.22	0.48
Subtotal										51.0	14280	35,700	78,540	0.17	0.41	0.91
Totals =	15									261.0	73,080	182,700	401,940	0.85	2.11	4.65

Summary

SUMMARY OF REQUIRED FIREFLOWS (RFFs)

Building #	Fire Flow, F (L/min)	[2]Type of Constr. Coeff, C	[3]Reduction Due to Occupancy (%)	[4]Reduction Due to Sprinklers (%)	[5]Total Increase due to Exposures (%)	[6]Required Fire Flow in	
						(L/min)	(L/sec)
BLOCK 1. Two (2) Northern units of 6 unit block. 3-storeys. (2 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-25%	6,000	100
BLOCK 1. Two (2) Central units of 6 unit block. 3-storeys. (2 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	0%	5,000	83
BLOCK 1. Two (2) Southern units of 6 unit block. 3-storeys. (2 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-4%	5,000	83
BLOCK 2. Two (2) Southern units of 5 unit block. 3-storeys. (2 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-22%	6,000	100
BLOCK 2. Two (2) Central units of 5 unit block. 3-storeys. (2 Firewall added), NO sprinklers.	8,000	1.5	-15%	0%	-2%	7,000	117
BLOCK 2. One (1) Northern unit of 5 unit block. 3-storeys. (2 Firewall added), NO sprinklers.	4,000	1.5	-15%	0%	-14%	4,000	67
BLOCK 3. One (1) Western unit of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.	5,000	1.5	-15%	0%	-10%	5,000	83
BLOCK 3. Two (2) Central units of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.	7,000	1.5	-15%	0%	-11%	7,000	117
BLOCK 3. Two (2) Central units of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.	7,000	1.5	-15%	0%	0%	6,000	100
BLOCK 3. Two (2) Eastern unit of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.	7,000	1.5	-15%	0%	-22%	7,000	117
BLOCK 4. Two (2) Western units of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.	7,000	1.5	-15%	0%	-24%	7,000	117
BLOCK 4. Two (2) Central units of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.	7,000	1.5	-15%	0%	0%	6,000	100
BLOCK 4. Two (2) Central units of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.	7,000	1.5	-15%	0%	-2%	6,000	100
BLOCK 4. One (1) Eastern unit of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.	5,000	1.5	-15%	0%	-25%	5,000	83
BLOCK 5. One (1) Western unit of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.	5,000	1.5	-15%	0%	-22%	5,000	83
BLOCK 4. Two (2) Central units of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.	7,000	1.5	-15%	0%	0%	6,000	100
BLOCK 4. Two (2) Central units of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.	7,000	1.5	-15%	0%	0%	6,000	100
BLOCK 5. Two (2) Eastern unit of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.	7,000	1.5	-15%	0%	-10%	7,000	117
BLOCK 6. Two (2) Central units of 5 unit block. 4-storeys. (2 Firewall added), NO sprinklers.	7,000	1.5	-15%	0%	-4%	6,000	100
BLOCK 6. One (1) Northern unit of 5 unit block. 4-storeys. (2 Firewall added), NO sprinklers.	5,000	1.5	-15%	0%	-10%	5,000	83
BLOCK 6. Two (2) Southern units of 5 unit block. 4-storeys. (2 Firewall added), NO sprinklers.	7,000	1.5	-15%	0%	-22%	7,000	117
BLOCK 7. Two (2) Northern units of 6 unit block. 4-storeys. (1 Firewall added), NO sprinklers.	7,000	1.5	-15%	0%	-22%	7,000	117
BLOCK 7. Two (2) Northern units of 6 unit block. 4-storeys. (1 Firewall added), NO sprinklers.	7,000	1.5	-15%	0%	0%	6,000	100
BLOCK 7. Two (2) Southern units of 6 unit block. 4-storeys. (1 Firewall added), NO sprinklers.	7,000	1.5	-15%	0%	-11%	7,000	117
BLOCK 8. Three (3) Western unit of 7 unit block. 3.5-storeys. (2 Firewall added), NO sprinklers.	8,000	1.5	-15%	0%	-8%	7,000	117
BLOCK 8. Two (2) Central unit of 7 unit block. 3.5-storeys. (2 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-2%	5,000	83
BLOCK 8. Two (2) Eastern units of 7 unit block. 3.5-storeys. (2 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-6%	5,000	83

Notes

1 - If basements are included (<50% below grade) then denoted as +.

2 -Types of constructions: 0.8 for non-combustible, 1.0 for ordinary construction,1.5 for wood frame construction.

3 - Reductions due to Occupancy are -25% for non-combustible or -15% for limited combustible.

4 - Reductions due to Sprinkler Systems

5 – Increase due to exposures were calculated based on FUS 2020.

6 – Required Fire Flows are rounded to nearest 1,000 L/min.

Min = 67

Max = 117

BLOCK 1-north

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 1. Two (2) Northern units of 6 unit block. 3-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	348.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,156
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input							Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible							-15%	-900	5,100
	Limited Combustible	-15%										
	Combustible	0%										
	Free Burning	15%										
	Rapid Burning	25%										
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler		Min =	0				0%	0	5,100
	No Sprinkler	0%			Max =	0						
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable							0%	0	5,100
	Not Standard Water Supply or Unavailable	0%										
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or							0%	0	5,100
	Not Fully Supervised or N/A	0%										
	Reduction for Community Sprinklers	-25%	Reduction due to Community Sprinklers							0%	0	5,100

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	3	1	0 to 3	Type V	29	3.5	101.5	1F	25%	25%	1,275	6,375
	South	FW	0	Firewall						0%			
	East	50	6	>45m						0%			
	West	50	6	>45m						0%			

Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	**6,000**
	Total Required Fire Flow, L/s =	**100**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 1-central

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 1. Two (2) Central units of 6 unit block. 3-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	348.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,156
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input							Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible							-15%	-900	5,100
	Limited Combustible	-15%										
	Combustible	0%										
	Free Burning	15%										
	Rapid Burning	25%										
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler		Min =	0				0%	0	5,100
	No Sprinkler	0%			Max =	0						
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable							0%	0	5,100
	Not Standard Water Supply or Unavailable	0%										
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or							0%	0	5,100
	Not Fully Supervised or N/A	0%										
	Reduction for Community Sprinklers	-25%	Reduction due to Community Sprinklers							0%	0	5,100

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposed Wall Length: Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	FW	0	Firewall						0%	0%	0	5,100
	South	FW	0	Firewall						0%			
	East	50	6	>45m						0%			
	West	50	6	>45m						0%			

Obtain Required Fire Flow		
	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	**5,000**
	Total Required Fire Flow, L/s =	**83**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 1-south

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 1. Two (2) Southern units of 6 unit block. 3-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	348.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,156
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-900	5,100
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,100
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,100
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised or						0%	0	5,100
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,100
Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	FW	0	Firewall						0%	4%	204	5,304
	South	22	4	20.1 to 30	Type V	29	2	58	4C	4%			
	East	50	6	>45m						0%			
	West	50	6	>45m						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**5,000**
	Total Required Fire Flow, L/s =												**83**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 2-south

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 2. Two (2) Southern units of 5 unit block. 3-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	351.6 m²	
	Floor 3 and above		117	100%	117			
	Floor 2		117	100%	117			
	Floor 1 (Main Level)		117	100%	117			
	Basement (At least 50% below grade, not included)		117	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,188
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-900	5,100
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,100
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,100
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised or						0%	0	5,100
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,100
Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	FW	0	Firewall						0%	22%	1,122	6,222
	South	3	1	0 to 3	Type V	12.6	3.5	44.1	1C	22%			
	East	30	4	20.1 to 30	Type V	4	3.5	14	4A	0%			
	West	50	6	>45m						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**6,000**
	Total Required Fire Flow, L/s =												**100**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 2-central

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 2. Two (2) Central units of 5 unit block. 3-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	527.4 m²	
	Floor 3 and above		176	100%	176			
	Floor 2		176	100%	176			
	Floor 1 (Main Level)		176	100%	176			
	Basement (At least 50% below grade, not included)		176	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							7,579
Fire Flow (F)	Rounded to nearest 1,000							**8,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input							Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible							-15%	-1,200	6,800
	Limited Combustible	-15%										
	Combustible	0%										
	Free Burning	15%										
	Rapid Burning	25%										
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler		Min =	0				0%	0	6,800
	No Sprinkler	0%			Max =	0						
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable							0%	0	6,800
	Not Standard Water Supply or Unavailable	0%										
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or							0%	0	6,800
	Not Fully Supervised or N/A	0%										
	Reduction for Community Sprinklers	-25%	Reductlon due to Community Sprinklers							0%	0	6,800

Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	FW	0	Firewall						0%	2%	136	6,936
	South	FW	0	Firewall						0%			
	East	30	4	20.1 to 30	Type V	9.0	3.5	31.5	4B	2%			
	West	50	6	>45m						0%			

Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	**7,000**
	Total Required Fire Flow, L/s =	**117**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 2-north

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 2. One (1) Northern unit of 5 unit block. 3-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	175.8 m²	
	Floor 3 and above		59	100%	59			
	Floor 2		59	100%	59			
	Floor 1 (Main Level)		59	100%	59			
	Basement (At least 50% below grade, not included)		59	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							4,375
Fire Flow (F)	Rounded to nearest 1,000							**4,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible						-15%	-600	3,400
	Limited Combustible	-15%									
	Combustible	0%									
	Free Burning	15%									
	Rapid Burning	25%									
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler		Min =	0			0%	0	3,400
	No Sprinkler	0%			Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable						0%	0	3,400
	Not Standard Water Supply or Unavailable	0%									
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or						0%	0	3,400
	Not Fully Supervised or N/A	0%									
	Reduction for Community Sprinklers	-25%	Reduction due to Community Sprinklers						0%	0	3,400

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	18.3	3	10.1 to 20	Type V	12.6	3.5	44.1	3C	12%	14%	476	3,876
	South	FW	0	Firewall						0%			
	East	30	4	20.1 to 30	Type V	8.1	3.5	28.35	4B	2%			
	West	50	6	>45m						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**4,000**
	Total Required Fire Flow, L/s =												**67**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 3-west

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 3. One (1) Western unit of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	233.1 m²	
	Floor 3 and above		58	100%	58			
	Floor 2		58	100%	58			
	Floor 1 (Main Level)		58	100%	58			
	Basement (At least 50% below grade, not included)		58	100%	58			
Fire Flow (F)	F = 220 * C * SQRT(A)							5,039
Fire Flow (F)	Rounded to nearest 1,000							**5,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input					Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible					-15%	-750	4,250
	Limited Combustible	-15%								
	Combustible	0%								
	Free Burning	15%								
	Rapid Burning	25%								
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler		Min =	0		0%	0	4,250
	No Sprinkler	0%			Max =	0				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable					0%	0	4,250
	Not Standard Water Supply or Unavailable	0%								
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or					0%	0	4,250
	Not Fully Supervised or N/A	0%								
	Reduction for Community Sprinklers	-25%	Reduction due to Community Sprinklers					0%	0	4,250

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	4.8	2	9.6	4A	0%	10%	425	4,675
	South	18.3	3	10.1 to 20	Type V	4.8	3.5	16.8	3A	10%			
	East	FW	0	Firewall						0%			
	West	50	6	>45m						0%			

Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	**5,000**
	Total Required Fire Flow, L/s =	**83**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 3-central-1

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 3. Two (2) Central units of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input	Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame	1.5	
	Ordinary Construction	1			
	Non-combustible Construction	0.8			
	Fire Resistive Construction	0.6			

Input Building Floor Areas (A)		Area	% Used	Area Used	Comment	Value Used	Fire Flow Total (L/min)
	Floor 3 and above	117	100%	117		466.3 m²	
	Floor 2	117	100%	117			
	Floor 1 (Main Level)	117	100%	117			
	Basement (At least 50% below grade, not included)	117	100%	117			
Fire Flow (F)	F = 220 * C * SQRT(A)						7,126
Fire Flow (F)	Rounded to nearest 1,000						**7,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-1,050	5,950
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler Min = 0	0%	0	5,950
	No Sprinkler	0%	Max = 0			
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	5,950
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or	0%	0	5,950
	Not Fully Supervised or N/A	0%				
	Reduction for Community Sprinklers	-25%	Reduction due to Community Sprinklers	0%	0	5,950

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	9.8	2	19.6	4A	0%	11%	655	6,605
	South	18.3	3	10.1 to 20	Type V	9.8	3.5	34.3	3B	11%			
	East	FW	0	Firewall						0%			
	West	FW	0	Firewall						0%			

Obtain Required Fire Flow		
	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	**7,000**
	Total Required Fire Flow, L/s =	**117**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 3-central-2

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 3. Two (2) Central units of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	466.3 m²	
	Floor 3 and above		117	100%	117			
	Floor 2		117	100%	117			
	Floor 1 (Main Level)		117	100%	117			
	Basement (At least 50% below grade, not included)		117	100%	117			
Fire Flow (F)	F = 220 * C * SQRT(A)							7,126
Fire Flow (F)	Rounded to nearest 1,000							**7,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-1,050	5,950
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,950
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,950
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised or						0%	0	5,950
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,950
Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	9.8	2	19.6	4A	0%	0%	0	5,950
	South	50	6	>45m						0%			
	East	FW	0	Firewall						0%			
	West	FW	0	Firewall						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**6,000**
	Total Required Fire Flow, L/s =												**100**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 3-east

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 3. Two (2) Eastern unit of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	466.3 m²	
	Floor 3 and above		117	100%	117			
	Floor 2		117	100%	117			
	Floor 1 (Main Level)		117	100%	117			
	Basement (At least 50% below grade, not included)		117	100%	117			
Fire Flow (F)	F = 220 * C * SQRT(A)							7,126
Fire Flow (F)	Rounded to nearest 1,000							**7,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-1,050	5,950
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,950
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,950
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised or						0%	0	5,950
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,950
Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	9.8	2	19.6	4A	0%	22%	1,309	7,259
	South	50	6	>45m						0%			
	East	3	1	0 to 3	Type V	12.2	3.5	42.7	1C	22%			
	West	FW	0	Firewall						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**7,000**
	Total Required Fire Flow, L/s =												**117**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 4-west

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 4. Two (2) Western units of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	466.3 m²	
	Floor 3 and above		117	100%	117			
	Floor 2		117	100%	117			
	Floor 1 (Main Level)		117	100%	117			
	Basement (At least 50% below grade, not included)		117	100%	117			
Fire Flow (F)	F = 220 * C * SQRT(A)							7,126
Fire Flow (F)	Rounded to nearest 1,000							**7,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-1,050	5,950
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,950
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,950
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised or						0%	0	5,950
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,950
Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	9.5	2	19	4A	0%	24%	1,428	7,378
	South	23.8	4	20.1 to 30	Type V	9.5	3.5	33.25	4B	2%			
	East	FW	0	Firewall						0%			
	West	3	1	0 to 3	Type V	12.2	3.5	42.7	1C	22%			
Obtain Required Fire Flow										Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =			**7,000**
										Total Required Fire Flow, L/s =			**117**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 4-central-1

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 4. Two (2) Central units of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	466.3 m²	
	Floor 3 and above		117	100%	117			
	Floor 2		117	100%	117			
	Floor 1 (Main Level)		117	100%	117			
	Basement (At least 50% below grade, not included)		117	100%	117			
Fire Flow (F)	F = 220 * C * SQRT(A)							7,126
Fire Flow (F)	Rounded to nearest 1,000							**7,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-1,050	5,950
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,950
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,950
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised or						0%	0	5,950
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,950
Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	9.5	2	19	4A	0%	0%	0	5,950
	South	50	6	>45m	Type V	23.8	3.5	83.3	6	0%			
	East	FW	0	Firewall						0%			
	West	FW	0	Firewall						0%			
Obtain Required Fire Flow											Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =		**6,000**
											Total Required Fire Flow, L/s =		**100**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 4-central-2

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 4. Two (2) Central units of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input	Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame	1.5	
	Ordinary Construction	1			
	Non-combustible Construction	0.8			
	Fire Resistive Construction	0.6			

Input Building Floor Areas (A)		Area	% Used	Area Used	Comment	Value Used	Fire Flow Total (L/min)
	Floor 3 and above	117	100%	117		466.3 m²	
	Floor 2	117	100%	117			
	Floor 1 (Main Level)	117	100%	117			
	Basement (At least 50% below grade, not included)	117	100%	117			
Fire Flow (F)	F = 220 * C * SQRT(A)						7,126
Fire Flow (F)	Rounded to nearest 1,000						**7,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-1,050	5,950
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler; Min = 0	0%	0	5,950
	No Sprinkler	0%	Max = 0			
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	5,950
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or	0%	0	5,950
	Not Fully Supervised or N/A	0%				
	Reduction for Community Sprinklers	-25%	Reduction due to Community Sprinklers	0%	0	5,950

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	9.5	2	19	4A	0%	2%	119	6,069
	South	23.8	4	20.1 to 30	Type V	9.5	3.5	33.25	4B	2%			
	East	FW	0	Firewall						0%			
	West	FW	0	Firewall						0%			

Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	**6,000**
	Total Required Fire Flow, L/s =	**100**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 4-east

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 4. One (1) Eastern unit of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	233.1 m²	
	Floor 3 and above		58	100%	58			
	Floor 2		58	100%	58			
	Floor 1 (Main Level)		58	100%	58			
	Basement (At least 50% below grade, not included)		58	100%	58			
Fire Flow (F)	F = 220 * C * SQRT(A)							5,039
Fire Flow (F)	Rounded to nearest 1,000							**5,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-750	4,250
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	4,250
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	4,250
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised or						0%	0	4,250
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	4,250
Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	4.8	2	9.6	4A	0%	25%	1,063	5,313
	South	23.8	4	20.1 to 30	Type V	4.8	3.5	16.8	4A	0%			
	East	3	1	0 to 3	Type V	29	3.5	101.5	1F	25%			
	West	FW	0	Firewall						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**5,000**
	Total Required Fire Flow, L/s =												**83**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 5-west

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 5. One (1) Western unit of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	233.1 m²	
	Floor 3 and above		58	100%	58			
	Floor 2		58	100%	58			
	Floor 1 (Main Level)		58	100%	58			
	Basement (At least 50% below grade, not included)		58	100%	58			
Fire Flow (F)	F = 220 * C * SQRT(A)							5,039
Fire Flow (F)	Rounded to nearest 1,000							**5,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-750	4,250
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	4,250
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	4,250
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised or						0%	0	4,250
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	4,250
Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	4.8	2	9.6	4A	0%	22%	935	5,185
	South	23.8	4	20.1 to 30	Type V	4.8	3.5	16.8	4A	0%			
	East	FW	0	Firewall						0%			
	West	3	1	0 to 3	Type V	12.2	3.5	42.7	1C	22%			
Obtain Required Fire Flow											Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =		**5,000**
											Total Required Fire Flow, L/s =		**83**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 5-central-1

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 4. Two (2) Central units of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	466.3 m²	
	Floor 3 and above		117	100%	117			
	Floor 2		117	100%	117			
	Floor 1 (Main Level)		117	100%	117			
	Basement (At least 50% below grade, not included)		117	100%	117			
Fire Flow (F)	F = 220 * C * SQRT(A)							7,126
Fire Flow (F)	Rounded to nearest 1,000							**7,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input					Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible					-15%	-1,050	5,950
	Limited Combustible	-15%								
	Combustible	0%								
	Free Burning	15%								
	Rapid Burning	25%								
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler		Min =	0		0%	0	5,950
	No Sprinkler	0%			Max =	0				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable					0%	0	5,950
	Not Standard Water Supply or Unavailable	0%								
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or					0%	0	5,950
	Not Fully Supervised or N/A	0%								
	Reduction for Community Sprinklers	-25%	Reduction due to Community Sprinklers					0%	0	5,950

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	9.6	2	19.2	4A	0%	0%	0	5,950
	South	50	6	>45m	Type V	23.8	3.5	83.3	6	0%			
	East	FW	0	Firewall						0%			
	West	FW	0	Firewall						0%			

Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	**6,000**
	Total Required Fire Flow, L/s =	**100**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 5-central-2

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 4. Two (2) Central units of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	466.3 m²	
	Floor 3 and above		117	100%	117			
	Floor 2		117	100%	117			
	Floor 1 (Main Level)		117	100%	117			
	Basement (At least 50% below grade, not included)		117	100%	117			
Fire Flow (F)	F = 220 * C * SQRT(A)							7,126
Fire Flow (F)	Rounded to nearest 1,000							**7,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input					Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible					-15%	-1,050	5,950
	Limited Combustible	-15%								
	Combustible	0%								
	Free Burning	15%								
	Rapid Burning	25%								
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler		Min =	0		0%	0	5,950
	No Sprinkler	0%			Max =	0				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable					0%	0	5,950
	Not Standard Water Supply or Unavailable	0%								
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or					0%	0	5,950
	Not Fully Supervised or N/A	0%								
	Reduction for Community Sprinklers	-25%	Reduction due to Community Sprinklers					0%	0	5,950

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	9.6	2	19.2	4A	0%	0%	0	5,950
	South	50	6	>45m						0%			
	East	FW	0	Firewall						0%			
	West	FW	0	Firewall						0%			

Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	**6,000**
	Total Required Fire Flow, L/s =	**100**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 5-east

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 5. Two (2) Eastern unit of 7 unit block. 4-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input	Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame	1.5	
	Ordinary Construction	1			
	Non-combustible Construction	0.8			
	Fire Resistive Construction	0.6			

Input Building Floor Areas (A)		Area	% Used	Area Used	Comment	Value Used	Fire Flow Total (L/min)
	Floor 3 and above	117	100%	117		466.3 m²	
	Floor 2	117	100%	117			
	Floor 1 (Main Level)	117	100%	117			
	Basement (At least 50% below grade, not included)	117	100%	117			
Fire Flow (F)	F = 220 * C * SQRT(A)						7,126
Fire Flow (F)	Rounded to nearest 1,000						**7,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-1,050	5,950
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler Min = 0	0%	0	5,950
	No Sprinkler	0%	Max = 0			
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	5,950
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or	0%	0	5,950
	Not Fully Supervised or N/A	0%				
	Reduction for Community Sprinklers	-25%	Reduction due to Community Sprinklers	0%	0	5,950

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	9.6	2	19.2	4A	0%	10%	595	6,545
	South	18.2	3	10.1 to 20	Type V	4.8	3.5	16.8	3A	10%			
	East	50	6	>45m						0%			
	West	FW	0	Firewall						0%			

Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	**7,000**
	Total Required Fire Flow, L/s =	**117**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 6-north

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 6. One (1) Northern unit of 5 unit block. 4-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	232.0 m²	
	Floor 3 and above		58	100%	58			
	Floor 2		58	100%	58			
	Floor 1 (Main Level)		58	100%	58			
	Basement (At least 50% below grade, not included)		58	100%	58			
Fire Flow (F)	F = 220 * C * SQRT(A)							5,026
Fire Flow (F)	Rounded to nearest 1,000							**5,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input					Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible					-15%	-750	4,250
	Limited Combustible	-15%								
	Combustible	0%								
	Free Burning	15%								
	Rapid Burning	25%								
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler		Min =	0		0%	0	4,250
	No Sprinkler	0%			Max =	0				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable					0%	0	4,250
	Not Standard Water Supply or Unavailable	0%								
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or					0%	0	4,250
	Not Fully Supervised or N/A	0%								
	Reduction for Community Sprinklers	-25%	Reduction due to Community Sprinklers					0%	0	4,250

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	18.3	3	10.1 to 20	Type V	2	3.5	7	3A	10%	10%	425	4,675
	South	FW	0	Firewall						0%			
	East	50	6	>45m						0%			
	West	50	6	>45m						0%			

Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	**5,000**
	Total Required Fire Flow, L/s =	**83**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 6-central

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 6. Two (2) Central units of 5 unit block. 4-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	464.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	100%	116			
Fire Flow (F)	F = 220 * C * SQRT(A)							7,108
Fire Flow (F)	Rounded to nearest 1,000							**7,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-1,050	5,950
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,950
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,950
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised or						0%	0	5,950
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,950
Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	FW	0	Firewall						0%	4%	238	6,188
	South	FW	0	Firewall						0%			
	East	50	6	>45m						0%			
	West	30	4	20.1 to 30	Type V	12.4	3.5	43.4	4C	4%			
Obtain Required Fire Flow											Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =		**6,000**
											Total Required Fire Flow, L/s =		**100**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 6-south

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 6. Two (2) Southern units of 5 unit block. 4-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	464.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	100%	116			
Fire Flow (F)	F = 220 * C * SQRT(A)							7,108
Fire Flow (F)	Rounded to nearest 1,000							**7,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-1,050	5,950
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,950
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,950
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised or						0%	0	5,950
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,950
Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	FW	0	Firewall						0%	22%	1,309	7,259
	South	3	1	0 to 3	Type V	12.3	3.5	43.05	1C	22%			
	East	50	6	>45m						0%			
	West	30	4	20.1 to 30	Type V	2.4	3.5	8.4	4A	0%			
Obtain Required Fire Flow											Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =		**7,000**
											Total Required Fire Flow, L/s =		**117**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 7-north

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 7. Two (2) Northern units of 6 unit block. 4-storeys. (1 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	464.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	100%	116			
Fire Flow (F)	F = 220 * C * SQRT(A)							7,108
Fire Flow (F)	Rounded to nearest 1,000							**7,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible						-15%	-1,050	5,950
	Limited Combustible	-15%									
	Combustible	0%									
	Free Burning	15%									
	Rapid Burning	25%									
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler		Min =	0			0%	0	5,950
	No Sprinkler	0%			Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable						0%	0	5,950
	Not Standard Water Supply or Unavailable	0%									
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or						0%	0	5,950
	Not Fully Supervised or N/A	0%									
	Reduction for Community Sprinklers	-25%	Reduction due to Community Sprinklers						0%	0	5,950

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	3	1	0 to 3	Type V	12.3	3.5	43.05	1C	22%	22%	1,309	7,259
	South	FW	0	Firewall						0%			
	East	50	6	>45m						0%			
	West	50	6	>45m						0%			

Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	**7,000**
	Total Required Fire Flow, L/s =	**117**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 7-central

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 7. Two (2) Central units of 6 unit block. 4-storeys. (1 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	464.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	100%	116			
Fire Flow (F)	F = 220 * C * SQRT(A)							7,108
Fire Flow (F)	Rounded to nearest 1,000							**7,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-1,050	5,950
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,950
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,950
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised or						0%	0	5,950
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,950
Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	FW	0	Firewall						0%	0%	0	5,950
	South	FW	0	Firewall						0%			
	East	50	6	>45m						0%			
	West	50	6	>45m						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**6,000**
	Total Required Fire Flow, L/s =												**100**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 7-south

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 7. Two (2) Southern units of 6 unit block. 4-storeys. (1 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	464.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	100%	116			
Fire Flow (F)	F = 220 * C * SQRT(A)							7,108
Fire Flow (F)	Rounded to nearest 1,000							**7,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible						-15%	-1,050	5,950
	Limited Combustible	-15%									
	Combustible	0%									
	Free Burning	15%									
	Rapid Burning	25%									
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler		Min =	0			0%	0	5,950
	No Sprinkler	0%			Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable						0%	0	5,950
	Not Standard Water Supply or Unavailable	0%									
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or						0%	0	5,950
	Not Fully Supervised or N/A	0%									
	Reduction for Community Sprinklers	-25%	Reduction due to Community Sprinklers						0%	0	5,950

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	FW	0	Firewall						0%	11%	655	6,605
	South	12	3	10.1 to 20	Type V	12.3	2	24.6	3B	11%			
	East	50	6	>45m						0%			
	West	50	6	>45m						0%			

Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	**7,000**
	Total Required Fire Flow, L/s =	**117**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 8-west

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 8. Three (3) Western unit of 7 unit block. 3.5-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	522.0 m²	
	Floor 3 and above		174	100%	174			
	Floor 2		174	100%	174			
	Floor 1 (Main Level)		174	100%	174			
	Basement (At least 50% below grade, not included)		174	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							7,540
Fire Flow (F)	Rounded to nearest 1,000							**8,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input							Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible							-15%	-1,200	6,800
	Limited Combustible	-15%										
	Combustible	0%										
	Free Burning	15%										
	Rapid Burning	25%										
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler		Min =	0				0%	0	6,800
	No Sprinkler	0%			Max =	0						
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable							0%	0	6,800
	Not Standard Water Supply or Unavailable	0%										
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or							0%	0	6,800
	Not Fully Supervised or N/A	0%										
	Reduction for Community Sprinklers	-25%	Reductlon due to Community Sprinklers							0%	0	6,800

Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	23.8	4	20.1 to 30	Type V	14.2	4	56.8	4C	4%	8%	544	7,344
	South	48	6	>45m	Type V	14.2	2	28.4	6	0%			
	East	FW	0	Firewall						0%			
	West	29.9	4	20.1 to 30	Type V	12.2	3.5	42.7	4C	4%			

Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	**7,000**
	Total Required Fire Flow, L/s =	**117**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 8-central

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 8. Two (2) Central unit of 7 unit block. 3.5-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	348.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,156
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-900	5,100
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,100
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,100
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised or						0%	0	5,100
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,100
Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	23.8	4	20.1 to 30	Type V	9.6	3.5	33.6	4B	2%	2%	102	5,202
	South	50	6	>45m	Type V	9.6	2	19.2	6	0%			
	East	FW	0	Firewall						0%			
	West	FW	0	Firewall						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**5,000**
	Total Required Fire Flow, L/s =												**83**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 8-east

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 8. Two (2) Eastern units of 7 unit block. 3.5-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	348.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,156
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input							Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible							-15%	-900	5,100
	Limited Combustible	-15%										
	Combustible	0%										
	Free Burning	15%										
	Rapid Burning	25%										
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler		Min =	0				0%	0	5,100
	No Sprinkler	0%			Max =	0						
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable							0%	0	5,100
	Not Standard Water Supply or Unavailable	0%										
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or							0%	0	5,100
	Not Fully Supervised or N/A	0%										
	Reduction for Community Sprinklers	-25%	Reduction due to Community Sprinklers							0%	0	5,100

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	23.8	4	20.1 to 30	Type V	9.6	4	38.4	4B	2%	6%	306	5,406
	South	50	6	>45m	Type V	9.6	2	19.2	6	0%			
	East	30	4	20.1 to 30	Type V	12.4	4	49.6	4C	4%			
	West	FW	0	Firewall						0%			

Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	**5,000**
	Total Required Fire Flow, L/s =	**83**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

Appendix C – Water Distribution Modelling Results

Boundary Condition 1 Result Tables

- Peak Hour Scenario
  - Junction Table
  - Pipe Table
  - Reservoir Table

- Max Day Plus Fireflow Scenario
  - Junction Table
  - Pipe Table
  - Fire Flow Report
  - Reservoir Table

Boundary Condition 2 Result Tables

- Peak Hour Scenario
  - Junction Table
  - Pipe Table
  - Reservoir Table

- Max Day Plus Fireflow Scenario
  - Junction Table
  - Pipe Table
  - Fire Flow Report
  - Reservoir Table


Goward Dr
J–100
Finlayson Crescent
J–185
Goward Dr
J–105
Goward Dr
J–106
J–110
J–165
J–115
J–160
J–155
J–175
J–120
J–150
J–145
J–125
J–140
J–180
J–130
J–135
J–170
Old Second Line Rd
Whernside Terrace
Whernside Terrace

Hydraulic Model Inventory: WaterGEMS Model_1158 Old Second Line_2023-06-06_1.wtg

Title	
Engineer	
Company	
Date	6/6/2023
Notes	

Scenario Summary

ID	1
Label	Base
Notes	
Active Topology	Base Active Topology
Physical	Base Physical
Demand	Base Demand
Initial Settings	Base Initial Settings
Operational	Base Operational
Age	Base Age
Constituent	Base Constituent
Trace	Base Trace
Fire Flow	Base Fire Flow
Energy Cost	Base Energy Cost
Transient	Base Transient
Pressure Dependent Demand	Base Pressure Dependent Demand
Failure History	Base Failure History
SCADA	Base SCADA
User Data Extensions	Base User Data Extensions
Steady State/EPS Solver Calculation Options	Base Calculation Options
Transient Solver Calculation Options	Base Calculation Options

Network Inventory

Pipes	24	<None>	1
Laterals	0	-Constant Speed - Four-Quadrant Characteristics	2
Junctions	19	-Constant Speed - Pump Definition	0
Hydrants	0	-Shut Down After Time Delay	0
Tanks	0	-Variable Speed/Torque	0
Reservoirs	2	-Pump Start - Variable Speed/Torque	0
Customer Meters	0	Pump Stations	0
Taps	0	Variable Speed Pump Batteries	0
SCADA Elements	0	PRV's	0
Pumps	2	PSV's	0
-Constant Power	0	PBV's	0
-Custom Extended	0	FCV's	0
-Design Point (1 Point)	0	TCV's	0
-Multiple Point	1	GPV's	0
-Standard (3 Point)	0	Isolation Valves	0
-Standard Extended	0	Spot Elevations	0

Hydraulic Model Inventory: WaterGEMS Model_1158 Old Second Line_2023-06-06_1.wtg

Transient Network Inventory			
Turbines	0	Rupture Disks	0
Periodic Head-Flows	0	Discharges to Atmosphere	0
Air Valves	0	Orifices Between Pipes	0
Hydropneumatic Tanks	0	Valves With Linear Area Change	0
Surge Valves	0	Surge Tanks	0
Check Valves	0		

Pressure Pipes Inventory			
100.0 (mm)	24 m	350.0 (mm)	222 m
203.0 (mm)	706 m	1,000.0 (mm)	8 m
282.9 (mm)	76 m	All Diameters	1,035 m

FlexTable: Junction Table

Label	Elevation (m)
J-100	100.76
J-105	101.19
J-106	101.19
J-110	101.70
J-115	102.60
J-120	103.00
J-125	103.40
J-130	103.90
J-135	104.20
J-140	103.50
J-145	102.60
J-150	102.60
J-155	102.50
J-160	102.60
J-165	101.70
J-170	101.19
J-175	101.19
J-180	103.50
J-185	101.19

FlexTable: Pipe Table

Label	Length (Scaled) (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-Williams C	Has User Defined Length?	Length (User Defined) (m)
P-100	118	J-100	J-105	203.0	PVC	110.0	False	0
P-105	63	J-105	J-110	203.0	PVC	110.0	False	0
P-110	15	J-110	J-115	203.0	PVC	110.0	False	0
P-115	37	J-115	J-120	203.0	PVC	110.0	False	0
P-120	35	J-120	J-125	203.0	PVC	110.0	False	0
P-125	25	J-125	J-130	203.0	PVC	110.0	False	0
P-130	26	J-130	J-135	203.0	PVC	110.0	False	0
P-135	31	J-135	J-140	203.0	PVC	110.0	False	0
P-140	30	J-140	J-145	203.0	PVC	110.0	False	0
P-145	19	J-145	J-150	203.0	PVC	110.0	False	0
P-150	16	J-150	J-155	203.0	PVC	110.0	False	0
P-155	11	J-155	J-160	203.0	PVC	110.0	False	0
P-160	26	J-160	J-165	203.0	PVC	110.0	False	0
P-165	153	J-165	J-170	203.0	PVC	110.0	False	0
P-170	76	J-170	J-175	282.9	PVC	110.0	False	0
P-175	24	J-125	J-180	100.0	PVC	100.0	False	0
P-180	93	J-100	J-185	350.0	PVC	130.0	False	0
P-181	128	J-185	J-175	350.0	PVC	130.0	False	0
P-10	4	R-1	PMP-1	1,000.0	Ductile Iron	130.0	True	2
P-15	5	PMP-1	J-100	1,000.0	Ductile Iron	130.0	True	2
P-20	7	R-2	PMP-2	1,000.0	Ductile Iron	130.0	True	2
P-25	7	PMP-2	J-175	1,000.0	Ductile Iron	130.0	True	2
P-205	2	J-115	J-160	203.0	PVC	110.0	False	0
P-106	100	J-105	J-106	203.0	PVC	110.0	False	0

Connection #1_ADD

FlexTable: Junction Table

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)
J-100	100.76	0.00	151.10	71
J-105	101.19	0.08	151.09	71
J-106	101.19	0.09	151.09	71
J-110	101.70	0.00	151.09	70
J-115	102.60	0.10	151.09	69
J-120	103.00	0.19	151.09	68
J-125	103.40	0.07	151.09	68
J-130	103.90	0.00	151.09	67
J-135	104.20	0.08	151.09	67
J-140	103.50	0.00	151.09	68
J-145	102.60	0.08	151.09	69
J-150	102.60	0.00	151.09	69
J-155	102.50	0.07	151.09	69
J-160	102.60	0.00	151.09	69
J-165	101.70	0.00	151.09	70
J-170	101.19	0.00	151.10	71
J-175	101.19	0.00	151.10	71
J-180	103.50	0.10	151.09	68
J-185	101.19	0.00	151.10	71

Connection #1_PHD

FlexTable: Junction Table

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)
J-100	100.76	0.00	140.24	56
J-105	101.19	0.42	140.24	55
J-106	101.19	0.48	140.23	55
J-110	101.70	0.00	140.23	55
J-115	102.60	0.52	140.23	53
J-120	103.00	1.05	140.23	53
J-125	103.40	0.37	140.23	52
J-130	103.90	0.00	140.23	52
J-135	104.20	0.45	140.23	51
J-140	103.50	0.00	140.23	52
J-145	102.60	0.45	140.23	53
J-150	102.60	0.00	140.23	53
J-155	102.50	0.37	140.23	54
J-160	102.60	0.00	140.23	53
J-165	101.70	0.00	140.23	55
J-170	101.19	0.00	140.24	55
J-175	101.19	0.00	140.24	55
J-180	103.50	0.52	139.88	52
J-185	101.19	0.00	140.24	55

Connection #1_MDD+FIRE

FlexTable: Junction Table

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Fire Flow (Available) (L/s)
J-100	100.76	0.00	150.53	71	(N/A)
J-105	101.19	0.19	150.53	70	(N/A)
J-106	101.19	0.22	150.53	70	(N/A)
J-110	101.70	0.00	150.53	69	(N/A)
J-115	102.60	0.24	150.53	68	132.22
J-120	103.00	0.48	150.53	67	128.45
J-125	103.40	0.17	150.53	67	125.47
J-130	103.90	0.00	150.53	66	123.40
J-135	104.20	0.20	150.53	66	122.32
J-140	103.50	0.00	150.53	67	124.79
J-145	102.60	0.20	150.53	68	127.21
J-150	102.60	0.00	150.53	68	128.96
J-155	102.50	0.17	150.53	68	130.68
J-160	102.60	0.00	150.53	68	132.21
J-165	101.70	0.00	150.53	69	(N/A)
J-170	101.19	0.00	150.53	70	(N/A)
J-175	101.19	0.00	150.53	70	(N/A)
J-180	103.50	0.24	150.52	67	(N/A)
J-185	101.19	0.00	150.53	70	(N/A)

Connection #2_ADD

FlexTable: Junction Table

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)
J-100	100.76	0.00	150.96	71
J-105	101.19	0.08	150.96	71
J-106	101.19	0.09	150.96	71
J-110	101.70	0.00	150.96	70
J-115	102.60	0.10	150.96	69
J-120	103.00	0.19	150.96	68
J-125	103.40	0.07	150.96	68
J-130	103.90	0.00	150.96	67
J-135	104.20	0.08	150.96	66
J-140	103.50	0.00	150.96	67
J-145	102.60	0.08	150.96	69
J-150	102.60	0.00	150.96	69
J-155	102.50	0.07	150.96	69
J-160	102.60	0.00	150.96	69
J-165	101.70	0.00	150.96	70
J-170	101.19	0.00	150.96	71
J-175	101.19	0.00	150.96	71
J-180	103.50	0.10	150.96	67
J-185	101.19	0.00	150.96	71

Connection #2_PHD

FlexTable: Junction Table

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)
J-100	100.76	0.00	140.18	56
J-105	101.19	0.42	140.18	55
J-106	101.19	0.48	140.17	55
J-110	101.70	0.00	140.17	55
J-115	102.60	0.52	140.17	53
J-120	103.00	1.05	140.17	53
J-125	103.40	0.37	140.17	52
J-130	103.90	0.00	140.17	51
J-135	104.20	0.45	140.17	51
J-140	103.50	0.00	140.17	52
J-145	102.60	0.45	140.17	53
J-150	102.60	0.00	140.17	53
J-155	102.50	0.37	140.17	53
J-160	102.60	0.00	140.17	53
J-165	101.70	0.00	140.17	55
J-170	101.19	0.00	140.18	55
J-175	101.19	0.00	140.18	55
J-180	103.50	0.52	139.82	52
J-185	101.19	0.00	140.18	55

Connection #2_MDD+FIRE

FlexTable: Junction Table

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Fire Flow (Available) (L/s)
J-100	100.76	0.00	150.42	70	(N/A)
J-105	101.19	0.19	150.41	70	(N/A)
J-106	101.19	0.22	150.41	70	(N/A)
J-110	101.70	0.00	150.41	69	(N/A)
J-115	102.60	0.24	150.41	68	133.15
J-120	103.00	0.48	150.41	67	129.38
J-125	103.40	0.17	150.41	67	126.35
J-130	103.90	0.00	150.41	66	124.29
J-135	104.20	0.20	150.41	66	123.22
J-140	103.50	0.00	150.41	67	125.70
J-145	102.60	0.20	150.41	68	128.14
J-150	102.60	0.00	150.41	68	129.89
J-155	102.50	0.17	150.41	68	131.62
J-160	102.60	0.00	150.41	68	133.13
J-165	101.70	0.00	150.41	69	(N/A)
J-170	101.19	0.00	150.42	70	(N/A)
J-175	101.19	0.00	150.42	70	(N/A)
J-180	103.50	0.24	150.41	67	(N/A)
J-185	101.19	0.00	150.42	70	(N/A)

Appendix D – Sanitary Design Sheet

Table D1: Sanitary Design Sheet

TABLE D1

SANITARY SEWER CALCULATION SHEET

LOCATION				RESIDENTIAL AREAS AND POPULATIONS											COMMERCIAL			INDUSTRIAL			INSTITUTIONAL		INFILTRATION			TOTAL FLOW (L/s)	SEWER DATA						
					NUMBER OF UNITS							POPULATION				AREA (ha)			AREA (ha)					AREA (ha)									
Street	U/S MH	D/S MH	Area Number	Area (ha)	Singles	Semis	Towns	Batch or 1-Bed Apt.	2-Bed Apt.	3-Bed Apt.	Total Units	INDIV	ACCU	Peak Factor	Peak Flow (L/sec)	INDIV	ACCU	Peak Flow (L/sec)	INDIV	ACCU	Peak Factor (per MOE)	AREA (Ha)	ACCU AREA (Ha)	INDIV	ACCU	INFILT FLOW (L/s)		Nom Dia (mm)	Actual Dia (mm)	Slope (%)	Length (m)	Capacity (L/sec)	Q/Q_{CAP} (%)	Full Velocity (m/s)
Antelope Priv	SANMH105	SANMH101	1	0.2320					22		22	46.2	46.2	3.66	0.55									0.2320	0.232	0.08	0.62	200	201.2	0.98	59.04	32.99	0.02	1.03
Antelope Priv	SANMH100	SANMH101	2	0.0940					8		8	16.8	16.8	3.71	0.20									0.0940	0.094	0.03	0.23	200	201.2	1.86	24.10	45.45	0.01	1.42
Antelope Priv	SANMH101	SANMH102	3	0.3970					42		42	88.2	151.2	3.55	1.74									0.3970	0.7230	0.24	1.98	200	201.2	2.43	70.34	51.95	0.04	1.62
Antelope Priv	SANMH106	SANMH102	4	0.4070					22		22	46.2	46.2	3.66	0.55									0.4070	0.407	0.13	0.68	200	201.2	0.65	59.13	26.87	0.03	0.84
Antelope Priv	SANMH102	SANMH103	5	0.0980					6		6	12.6	210	3.51	2.39									0.0980	1.228	0.41	2.79	200	201.2	0.40	23.67	21.08	0.13	0.66
Antelope Priv	SANMH103	SANMH108											210	3.51	2.39										1.228	0.41	2.79	200	201.2	0.40	22.61	21.08	0.13	0.66
	SANMH108	SANMH109											210	3.51	2.39										1.228	0.41	2.79	200	201.2	1.83	40.46	45.08	0.06	1.40
	SANMH109	EXMH											210	3.51	2.39										1.228	0.41	2.79	200	201.2	0.40	11.20	21.08	0.13	0.66
				1.228					100		100	210.0											1.2280			310.55							

Residential Avg. Daily Flow, q (L/p/day) =	280	Commercial Peak Factor =	1.5	(when area >20%)	Peak Population Flow, (L/sec) =	P*q*M/86.4	Unit Type / Persons/Unit
Commercial Avg. Daily Flow (L/gross ha/day) =	28,000		1.0	(when area <20%)	Peak Extraneous Flow, (L/sec) =	I*Ac	Singles 3.4
or L/gross ha/sec =	0.324				Residential Peaking Factor, M =	1 + (14/(4+P^0.5)) * K	Semi-Detached 2.7
Institutianal Avg. Daily Flow (L/day/ha) =	28,000	Institutional Peak Factor =	1.5	(when area >20%)	A_c = Cumulative Area (hectares)		Townhomes 2.7
or L/gross ha/day =	0.324		1.0	(when area <20%)	P = Population (thousands)		Batchelor or 1-bed Apt. Unit 1.4
Light Industrial Flow (L/gross ha/day) =	35,000						
or L/gross ha/sec =	0.40509	Residential Correction Factor, K =	0.80		Sewer Capacity, Qcap (L/sec) =	$1/N \; S^{1/2} \; R^{2/3} \; A_c$	2-bed Apt. Unit 2.1
Light Industrial Flow (L/gross ha/day) =	55,000	Manning N =	0.013		(Manning's Equation)		3-bed Apt. Unit 3.1
or L/gross ha/sec =	0.637	Peak extraneous flow, I (L/s/ha) =	0.33	(Total I/I)			4-bed Apt. Unit 3.8

Designed:	Project:
Z. Pan, P.Eng.	1158 Second Line
Checked:	Location:
B. Thomas, P.Eng.	Ottawa, Ontario
File Reference:	Page No:
245003 Water Demand Chart, Jun 2023 FINAL.xlsx	**1 of 1**

Appendix E – Stormwater Design Sheets

Table E1: 2-year Storm Sewer Calculation Sheet

Table E2: 100-year HGL Storm Sewer Calculation Sheet

Table E3: Average Runoff Coefficients (Pre-Development)

Table E4: Pre-Development Runoff Calculations

Table E5: Allowable Runoff Calculations

Table E6: Average Runoff Coefficients (Post-Development)

Table E7: Summary of Post Development Runoff (Uncontrolled and Controlled)

Table E9: Storage Volumes for 2-year, 5-Year and 100-Year Storms (MRM)

TABLE E3 - AVERAGE RUNOFF COEFFICIENTS (Pre Development)

Runoff Coeffients		C_{gravel} =	0.80	C_{ROOF} =	0.90	C_{GRASS} =	0.20	C_{Conc} =	0.90		
Area No.	Gravel Areas (m^2)	A * C_{GRAV}	Roof Areas (m^2)	A * C_{ROOF}	Grassed Areas (m^2)	A * C_{GRASS}	Conc (m^2)	A * C_{CONC}	Sum AC	Total Area (m^2)	C_{AVG}
Entire Site (for info only)	325.4	260.3	214.9	193.4	11432	2286.4	37.7	33.93	2774.1	12010.0	0.23
PRE-1	25.4	20.3			1015	202.9			223.2	1040.0	0.21
PRE-2	300	240.0	214.9	193.4	10417	2083.5	37.7	33.93	2550.8	10970.0	0.23
Totals	325.4	260.3	214.9	193.4	11,432.0	2,286.4	37.7	33.9	2,774.1	12,010.0	0.23
Site % IMP = 4.8%								Average Runoff Coeff =		C_{AVG} =	**2,774 / 12,010 = 0.23**

TABLE E4 - PRE-DEVELOPMENT RUNOFF CALCULATIONS

Area Description	Area (ha)	Time of Conc, Tc (min)	Storm = 2 yr			Storm = 5 yr			Storm = 100 yr		
			I_2 (mm/hr)	Cavg	Q_{5PRE} (L/sec)	I_5 (mm/hr)	Cavg	Q_{5PRE} (L/sec)	I_{100} (mm/hr)	Cavg	Q_{100PRE} (L/sec)
Entire Site (for info only)	1.2010	20	52.03	0.23	40.1	70.25	0.23	54.2	119.95	0.23	92.5
PRE-1	0.1040	20	52.03	0.21	3.2	70.25	0.21	4.4	119.95	0.21	7.4
PRE-2	1.0970	20	52.03	0.23	36.9	70.25	0.23	49.8	119.95	0.23	85.1
Totals	1.2010				40.1			54.2			92.5

Notes

2-yr Storm Intensity, I = 732.951/(Tc+6.199)$^{0.810}$ (City of Ottawa)

5-yr Storm Intensity, I = 998.071/(Tc+6.035)$^{0.814}$ (City of Ottawa)

100-yr Storm Intensity, I = 1735.688/(Tc+6.014)$^{0.820}$ (City of Ottawa)

Cavg for 100-year is increased by 25%

TABLE E5 - ALLOWABLE RUNOFF CALCULATIONS

Area Description	Area (ha)	Time of Conc, Tc (min)	Storm = 5 yr			Q_{ICD} (L/sec)
			I_5 (mm/hr)	Cavg	Q_{ALLOW} (L/sec)	
Total Site	1.2010	20	70.29	0.50	117.3	100.0
Totals	1.2010				117.3	100.0

Notes

Allowable Capture Rate is based on 5-year storm at Tc=20 minutes.

QICD is the Controlled Release Rate as per Morgan's Grant, Phase 12D SWM Report

5-yr Storm Intensity, I = 998.071/(Tc+6.035)$^{0.814}$ (City of Ottawa)

TABLE E6 - AVERAGE RUNOFF COEFFICIENTS (Post Development)

Runoff Coeffients		$C_{ASPH/CONC}$ =	0.90	C_{ROOF} =	0.90	C_{GRASS} =	0.20			
Area No.	Asphalt / Conc Areas (m^2)	A * C_{ASPH}	Roof Areas (m^2)	A * C_{ROOF}	Grassed Areas (m^2)	A * C_{GRASS}	Sum AC	[1]Total Area (m^2)	[2]C_{AVG}	Comments
Entire Site	*3389*	*3050.1*	*4128.0*	*3715.2*	*4490.0*	*898.0*	*7663.3*	*12007*	*0.64*	*For Info*
U1			70	*63.0*	310	*62.0*	*125.0*	380	*0.33*	Uncontrolled
U2			88	*78.8*	1596	*319.2*	*398.0*	1684	*0.24*	Uncontrolled
A1	2452	*2207.1*			140	*28.0*	*2235.1*	2592	*0.86*	
A2	3248	*2923.4*			437	*87.4*	*3010.8*	3685	*0.82*	
A3	1841	*1656.9*			563	*112.6*	*1769.5*	2404	*0.74*	
A4	320	*288.0*			942	*188.4*	*476.4*	1262	0.38	
Total	7,861.5	7,075.4	157.6	141.8	3,988.0	797.6	8,014.8	12007	0.67	
Site % IMP = 67%					Average Runoff Coeff =		C_{AVG} =	8,015 / 12,007	= 0.67	

Notes

1) Areas taken from PCSWMM, CAD

2) Cavg From PCSWMM (Area Weighting)

TABLE E7 - SUMMARY OF POST DEVELOPMENT RUNOFF (Uncontrolled and Controlled)

		Time of	Storm = 2 yr				Storm = 5 yr				Storm = 100 yr				
Area No	Area (ha)	Conc, Tc (min)	C_{AVG}	I_2 (mm/hr)	Q (L/sec)	Q_{CAP} (L/sec)	C_{AVG}	I_5 (mm/hr)	Q (L/sec)	Q_{CAP} (L/sec)	C_{AVG}	I_{100} (mm/hr)	Q (L/sec)	Q_{CAP} (L/sec)	Comments
U1	0.0380	10	0.33	76.81	2.7	**2.7**	0.33	104.19	3.6	**3.6**	0.41	178.56	7.8	**7.8**	Overland to Second Line
U2	0.1684	10	0.24	76.81	8.5	**8.5**	0.24	104.19	11.5	**11.5**	0.30	178.56	24.7	**24.7**	Overland to Hydro Corridor
A1	0.2592	10	0.86	76.81	47.7		0.86	104.19	64.7		1.00	178.56	128.7		
A2	0.3685	10	0.82	76.81	64.3	**28.4**	0.82	104.19	87.2	**38.5**	1.00	178.56	182.9	**80.0**	Controlled Outlet from U/G Storage Tanks via ICD
A3	0.2404	10	0.74	76.81	37.8		0.74	104.19	51.3		0.92	178.56	109.8		
A4	0.1262	10	0.38	76.81	10.2		0.38	104.19	13.8		0.47	178.56	29.6		
Foundations														**3.15**	
Totals	1.2007				171.1	**39.5**			232.2	**53.6**			483.4	**115.6**	

Notes

2-yr Storm Intensity, I = 732.951/(Tc+6.199)$^{0.810}$ (City of Ottawa)

5-yr Storm Intensity, I = 998.071/(Tc+6.035)$^{0.814}$ (City of Ottawa)

100-yr Storm Intensity, I = 1735.688/(Tc+6.014)$^{0.820}$ (City of Ottawa)

Time of Concentration (min), Tc = **10 mins**

100yr Peak to Goward Storm = 80.0

100yr Peak to Second Line = 7.8

100yr Peak to Hydro Corridor = 24.7

For Flows under column Qcap which are shown in brackets (0.0), denotes flows that are uncontrolled

TABLE E9 Storage Volumes for 2-year, 5-Year and 100-Year Storms (MRM)

Area No: **A1 - A4**

C_{AVG} = 0.75 (2-yr)

C_{AVG} = 0.75 (5-yr)

C_{AVG} = 0.94 (100-yr, Max 1.0)

Time Interval = 10.00 (mins)

Drainage Area = 0.9944 (hectares)

Actual Release Rate (L/sec) = 80.0

Percentage of Actual Rate (City of Ottawa requirement) = 50% (Set to 50% when U/G storage used)

Release Rate Used for Estimation of 100-year Storage (L/sec) = 40.0

Intensity Incr (%) = 20% Use 20% for Climate Change

Duration (mins)	Release Rate = 28.4 (L/sec), Return Period = 2 (years), IDF Parameters, A = 733.0, B = 0.810, C = 6.199 (I = A/(T_c+C))					Release Rate = 38.5 (L/sec), Return Period = 5 (years), IDF Parameters, A = 998.1, B = 0.814, C = 6.053 (I = A/(T_c+C))					Release Rate = 40.0 (L/sec), Return Period = 100 (years), IDF Parameters, A = 1735.7, B = 0.820, C = 6.014 (I = A/(T_c+C))					Release Rate = 40.0 (L/sec), Return Period = 100+20% (years), IDF Parameters, A = 1735.7, B = 0.820, C = 6.014 (I = A/(T_c+C))				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	167.2	348.3	28.4	319.9	0.0	230.5	480.0	38.5	441.5	0.0	398.6	1037.8	40.0	997.8	0.0	478.3	1245.3	40.0	1205.3	0.0
10	76.8	160.0	28.4	131.6	79.0	104.2	217.0	38.5	178.5	107.1	178.6	464.9	40.0	424.9	254.9	214.3	557.8	40.0	517.8	310.7
20	52.0	108.4	28.4	80.0	96.0	70.3	146.3	38.5	107.8	129.4	120.0	312.3	40.0	272.3	326.7	143.9	374.7	40.0	334.7	401.7
30	40.0	83.4	28.4	55.0	99.0	53.9	112.3	38.5	73.8	132.9	91.9	239.2	40.0	199.2	358.5	110.2	287.0	40.0	247.0	444.6
40	32.9	68.4	28.4	40.1	96.2	44.2	92.0	38.5	53.5	128.5	75.1	195.6	40.0	155.6	373.5	90.2	234.8	40.0	194.8	467.4
50	28.0	58.4	28.4	30.0	90.1	37.7	78.4	38.5	39.9	119.8	64.0	166.5	40.0	126.5	379.5	76.7	199.8	40.0	159.8	479.4
60	24.6	51.1	28.4	22.8	82.0	32.9	68.6	38.5	30.1	108.4	55.9	145.5	40.0	105.5	379.9	67.1	174.6	40.0	134.6	484.6
70	21.9	45.6	28.4	17.3	72.5	29.4	61.2	38.5	22.7	95.2	49.8	129.6	40.0	89.6	376.4	59.7	155.5	40.0	115.5	485.3
80	19.8	41.3	28.4	12.9	62.0	26.6	55.3	38.5	16.8	80.8	45.0	117.1	40.0	77.1	370.2	54.0	140.6	40.0	100.6	482.7
90	18.1	37.8	28.4	9.4	50.8	24.3	50.6	38.5	12.1	65.3	41.1	107.0	40.0	67.0	361.9	49.3	128.4	40.0	88.4	477.5
100	16.7	34.9	28.4	6.5	39.0	22.4	46.7	38.5	8.2	49.0	37.9	98.7	40.0	58.7	352.1	45.5	118.4	40.0	78.4	470.5
110	15.6	32.4	28.4	4.0	26.7	20.8	43.4	38.5	4.9	32.2	35.2	91.6	40.0	51.6	340.9	42.2	110.0	40.0	70.0	461.8
120	14.6	30.3	28.4	2.0	14.1	19.5	40.5	38.5	2.0	14.8	32.9	85.6	40.0	45.6	328.6	39.5	102.8	40.0	62.8	451.9
130	13.7	28.5	28.4	0.1	1.1	18.3	38.1	38.5	-0.4	-3.1	30.9	80.4	40.0	40.4	315.4	37.1	96.5	40.0	56.5	440.9
140	12.9	26.9	28.4	-1.5	-12.2	17.3	36.0	38.5	-2.5	-21.3	29.2	75.9	40.0	35.9	301.5	35.0	91.1	40.0	51.1	429.0
150	12.3	25.5	28.4	-2.9	-25.7	16.4	34.1	38.5	-4.4	-39.8	27.6	71.9	40.0	31.9	286.9	33.1	86.3	40.0	46.3	416.3
160	11.7	24.3	28.4	-4.1	-39.5	15.6	32.4	38.5	-6.1	-58.5	26.2	68.3	40.0	28.3	271.8	31.5	82.0	40.0	42.0	402.9
170	11.1	23.1	28.4	-5.2	-53.4	14.8	30.9	38.5	-7.6	-77.6	25.0	65.1	40.0	25.1	256.1	30.0	78.1	40.0	38.1	389.0
180	10.6	22.1	28.4	-6.2	-67.4	14.2	29.5	38.5	-9.0	-96.8	23.9	62.2	40.0	22.2	240.1	28.7	74.7	40.0	34.7	374.5
190	10.2	21.2	28.4	-7.2	-81.7	13.6	28.3	38.5	-10.2	-116.2	22.9	59.6	40.0	19.6	223.6	27.5	71.5	40.0	31.5	359.5
200	9.8	20.4	28.4	-8.0	-96.0	13.0	27.2	38.5	-11.3	-135.8	22.0	57.2	40.0	17.2	206.7	26.4	68.7	40.0	28.7	344.1
Max =					**99.0**					**132.9**					**379.9**					**485.3**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A

2) Rainfall Intensity, I = $A/(Tc+C)^B$

3) Release Rate = Min (Release Rate, Peak Flow)

4) Storage Rate = Peak Flow - Release Rate

5) Storage = Duration x Storage Rate

6) Maximium Storage = Max Storage Over Duration

7) Parameters a,b,c are for City of Ottawa

City of Ottawa IDF Data (from SDG002)

IDF curve equations (Intensity in mm/hr)

100 year Intensity = $1735.688 / (\text{Time in min} + 6.014)^{0.820}$

50 year Intensity = $1569.580 / (\text{Time in min} + 6.014)^{0.820}$

25 year Intensity = $1402.884 / (\text{Time in min} + 6.018)^{0.819}$

10 year Intensity = $1174.184 / (\text{Time in min} + 6.014)^{0.816}$

5 year Intensity = $998.071 / (\text{Time in min} + 6.053)^{0.814}$

2 year Intensity = $732.951 / (\text{Time in min} + 6.199)^{0.810}$

TABLE E2: 100-YEAR HGL STORM SEWER CALCULATION SHEET

Return Period Storm = **100-year** (2-year, 5-year, 100-year)
Default Inlet Time= 10 (minutes)
Manning Coefficient = 0.013 (dimensionless)

From Node	To Node	AREA INFO				FLOW (UNRESTRICTED)							INDIV CAP FLOW (L/s)	CUMUL CAP FLOW (L/s)	SEWER DATA									
		Area No.	Area (ha)	∑ Area (ha)	Average R	Indiv. 2.78*A*R	Accum. 2.78*A*R	Tc (mins)	I (mm/h)	Indiv. Flow	Return Period	Q (L/s)			Dia (mm) Actual	Dia (mm) Nominal	Type	*Slope (%)*	*Length (m)*	Capacity, Q_{CAP} (L/sec)	Velocity (m/s) Vf	Velocity (m/s) Va	Time in Pipe, Tt (min)	Hydraulic Ratios Q/Q_{CAP}	Hydraulic Ratios Va/Vf
CBMH04	CBMH05	**A1**	0.2592	0.2592	1.00	0.721	0.7207	10.00	178.56	128.68	100-year	128.7			447.9	450	CONC	***0.52***	***57.87***	203.01	1.29	1.19	0.81	0.63	0.92
CBMH05	CBMH07	**A2**	0.3685	0.6278	1.00	1.024	1.7451	10.81	171.47	175.67	100-year	299.2			610.0	600	CONC	***0.52***	***30.91***	462.72	1.57	1.44	0.36	0.65	0.92
CBMH08	CBMH07	**A3**	0.2404	0.2404	0.92	0.615	0.6149	10.00	178.56	109.80	100-year	109.8			447.9	450	CONC	***2.01***	***12.94***	399.13	2.54	1.78	0.12	0.28	0.70
CBMH07	U/G TANK						2.3600	11.17	168.54		100-year	397.8			610.0	600	CONC	***1.57***	***5.37***	804.02	2.72	1.92	0.05	0.49	0.71
CB	U/G TANK	**A4**	0.1262	0.1262	0.47	0.166	0.1655	10.00	178.56	29.56	100-year	29.6			251.5	250	PVC	***2.00***	***3.00***	85.42	1.71	1.20	0.04	0.35	0.70
TOTALS =			**0.9944**			**2.526**																		

Definitions:

Q = 2.78*AIR, where

Q = Peak Flow in Litres per second (L/s)

A = Watershed Area (hectares)

I = Rainfall Intensity (mm/h)

R = Runoff Coefficients (dimensionless)

Ottawa Rainfall Intensity Values from Sewer Design Guidelines, SDG002

	a	b	c
2-year	732.951	6.199	0.810
5-year	998.071	6.053	0.814
100-year	1735.688	6.014	0.820

Designed:	Project:	
A.Salem, P.Eng.	THEBERGE HOMES	
Checked:	Location:	
B. Thomas, P.Eng.	1158 OLD SECOND LINE ROAD	
Dwg Reference:	File Ref:	Sheet No:
Drawing C09	245003 Storm Design Sheets, 2023-06-06_100yr.xlsx	1 of 1

TABLE E1: 2-YEAR STORM SEWER CALCULATION SHEET

Return Period Storm =
Default Inlet Time=
Manning Coefficient =

From Node	To Node	CONTROLLED FLOW (L/s)	No. of Units	Accum. No. of Units	Foundation Q (L/s)	CUMULATIVE FLOW (L/s)	SEWER DATA					
							Dia (mm) Actual	Dia (mm) Nominal	Type	Slope (%)	Length (m)	Capacity, Q_{CAP} (L/sec)
STMH 205	STMMH 201		2	2	0.90	0.90	251.5	250	PVC	1.02	62.35	61.00
STMH 200	STMMH 201		1	3	1.35	1.35	251.5	250	PVC	1.86	24.10	82.37
STMH 201	STMMH 202		2	5	2.25	2.25	251.5	250	PVC	2.20	73.34	89.58
STMH 211	STMMH 206		1	1	0.45	0.45	251.5	250	PVC	1.47	22.29	73.23
Underground SWM Chambers	STMMH 206	80.0					299.4	300	PVC	1.48	13.15	116.97
STMMH 206	STMMH 202		1	2	0.90	80.90	366.4	375	PVC	0.75	20.67	142.75
STMMH 202	STMMH 203			7	3.15	83.15	447.9	450	CONC	0.40	20.67	178.05
STMMH 203	STMMH 208			7	3.15	83.15	447.9	450	CONC	0.40	20.93	178.05
STMMH 208	STMMH 209	8.50				91.65	447.9	450	CONC	1.67	40.65	363.81
STMMH 209	STMMH 210					91.65	447.9	450	CONC	0.40	12.28	178.05
TOTALS =												

Definitions:

Q = 2.78*AIR, where

Q = Peak Flow in Litres per second (L/s)

A = Watershed Area (hectares)

I = Rainfall Intensity (mm/h)

R = Runoff Coefficients (dimensionless)

Designed:	Project:
Z. Pan, P.Eng.	THEBERGE HOMES
Checked:	Location:
B. Thomas, P.Eng.	1158 OLD SECOND LINE ROAD
Dwg Reference:	File Ref:
Drawing C09	245003 Storm Design Sheets Jun 10, 2023.xlsx

Appendix F

NOT INCLUDED

Appendix G – Correspondence

Correspondence from City of Ottawa – Hydraulic Boundary Conditions

Boundary Conditions 1158 Second Line Road

Information Provided

Date provided: 05 April 2018

Provided Information:

Scenario	Demand	
	L/min	L/s
Average Daily Demand	30.6	0.5
Maximum Daily Demand	178.2	3.0
Peak Hour	269.4	4.5
Fire Flow Demand	8000	133
Fire Flow Demand	9000	150
Fire Flow Demand	11000	183

# of connections 2

Location

Results

Connection 1 - Goward Dr.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	150.9	71.4
Peak Hour	140.2	56.2
Max Day plus Fire (8,000 l/min)	123.8	32.9
Max Day plus Fire (9,000 l/min)	119.5	26.7
Max Day plus Fire (10,000 l/min)	118.3	25.1

[1] Ground Elevation = 100.76 m

Connection 2 - Whernside Terr

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	150.9	70.6
Peak Hour	142.0	55.5
Max Day plus Fire (8,000 l/min)	124.9	33.7
Max Day plus Fire (9,000 l/min)	120.8	27.9
Max Day plus Fire (10,000 l/min)	119.9	26.5

[1] Ground Elevation = 101.19 m

Consideration

1. Maximum fire flow city will accommodate for about 1158 Second Line Road property is 10,000 L/min.

Disclaimer

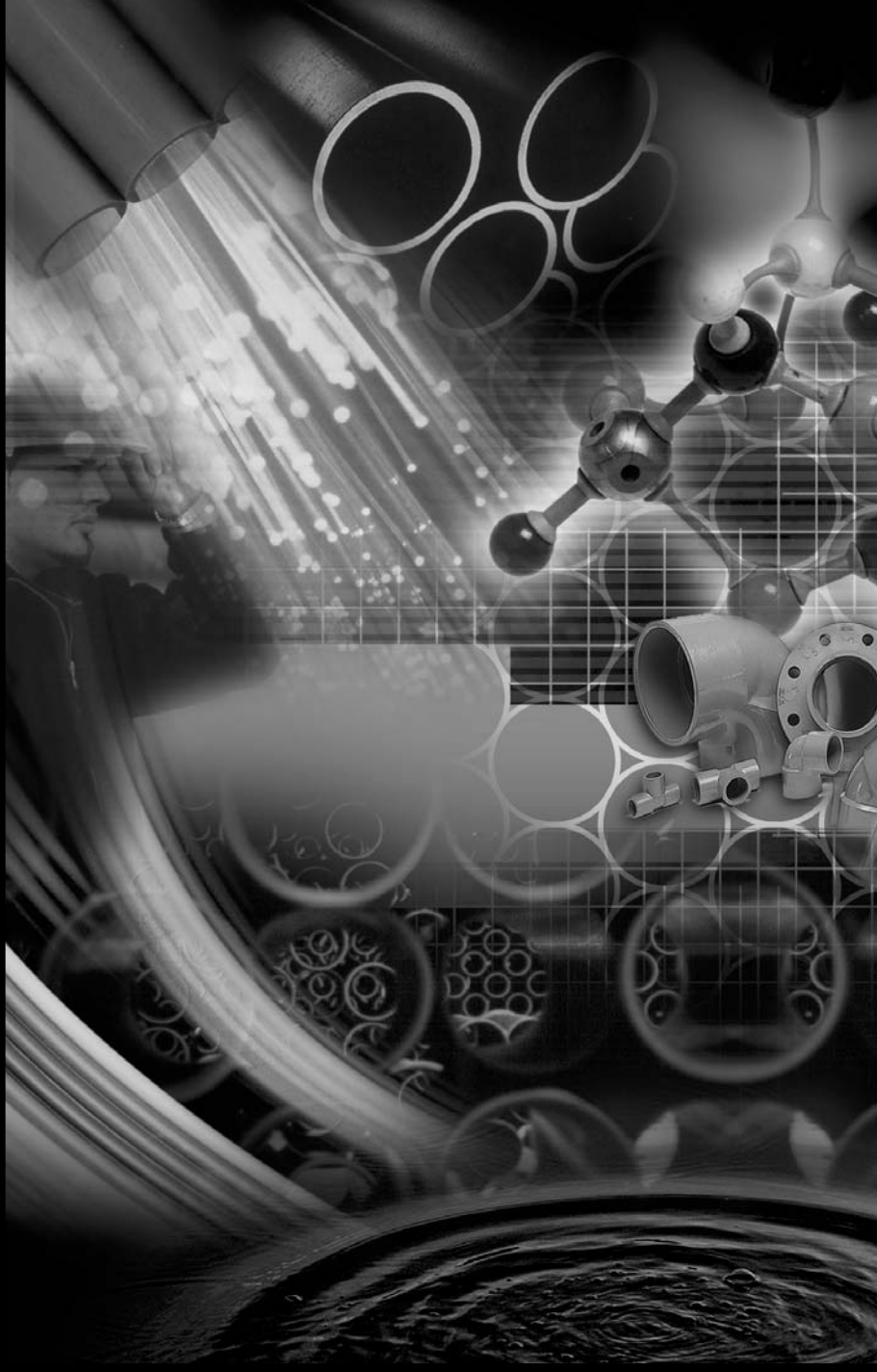
The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

Appendix H – Manufacturer Information

Tempest Inlet Control Device

Volume III: TEMPEST™ INLET CONTROL DEVICES

Municipal Technical Manual Series



SECOND EDITION

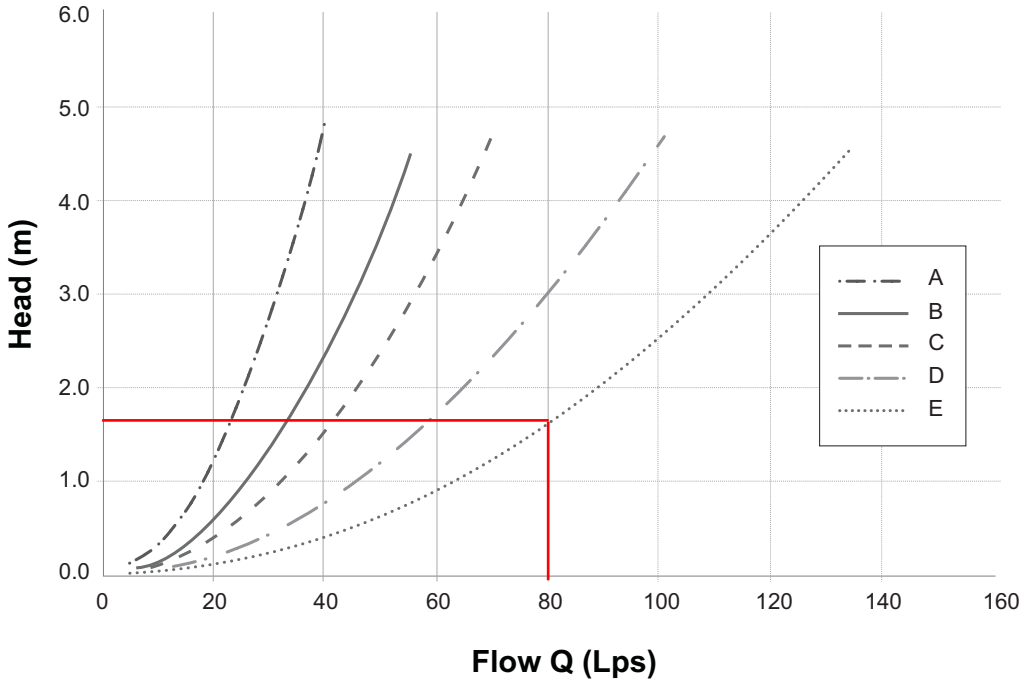
LMF (Low to Medium Flow) ICD

HF (High Flow) ICD

MHF (Medium to High Flow) ICD

IPEX

Chart 3: HF & MHF Preset Flow Curves



Appendix I – Background Information

- **Master Design Sheet (Hydraulic Grade Line Analysis). From Stormwater Management Report, Morgan Grant, Phase 12D (Report R-1591.A). 1 page.**
- **5-year Storm Design Sheet. From Stormwater Management Report, Morgan Grant, Phase 12D (Report R-1591.A). 2 pages.**
- **Stormwater Storage / Overland Balance Table. From Stormwater Management Report, Morgan Grant, Phase 12D (Report R-1591.B). 1 page.**
- **Storm Drainage Plan, Morgan's Grant Phase 12D. From Stormwater Management Report, Morgan Grant, Phase 12D (Report R-1591.B). 1 page.**
- **Storm Drainage Plan, Morgan's Grant Phase 12D. 1 page.**
- **Sanitary Drainage Plan, Morgan's Grant Phase 12D. 1 page.**
- **Morgan's Grant Master Sanitary Flows. From Master Servicing Study for the Morgan's Grant Subdivision (Report R-2168). 3 pages.**
- **Master Drainage Plan (Sanitary). From Master Servicing Study for the Morgan's Grant Subdivision (Report R-2168). 1 page.**
- **Pages 3, 4, 5 from Master Servicing Study for the Morgan's Grant Subdivision (Report R-2168). 3 pages.**
- **ECA for Storm and Sanitary Sewers No: 1005-6J6K7W-14**
- **ECA for SWM Facility. No: 9327-54JRK4-14**
- **Morgan's Grant Phase 12D, Goward Drive – Plan & Profile, Drawing # 17732-15. 1 page.**

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MORGAN'S GRANT - STAGE 12 - Minto Developments Inc.
(MASTER DESIGN SHEET)
CITY OF OTTAWA
JLR No.: 17732

STORM SEWER DESIGN SHEET AND
HYDRAULIC GRADE LINE ANALYSIS

Date: September 3, 2003
Revised : December 17, 2004
Revised : August 24, 2005
Designed by: G.F.
Checked by: L.J.
Updated by: J.B.
Checked by: L.J.

100 YEAR IDF CURVE

Manning's Coefficient (n) = 0.013

Part 1: Areas, peak flow generation, total CB with ICD

STREET	MANHOLE NUMBER From	To	AREAS WITH UNRESTRICTED FLOWS (ha) 0.2	0.38	0.4	0.45	0.5	0.55	0.6	0.7	0.95	1:100 YR PEAK FLOW GENERATION 2.78AR	2.78AR CUMM	Time min	Intens. mm/hr	Peak Flow L/s	Total CB With ICD: ICD Type 'A' @ 20.0 l/s	CUMM @ 20.0 l/s	ICD Flow (l/s)	External Flow (l/s)	CUMM Ext. Flow (l/s)	1:100 yr Capt. Flow (l/s)	Q_d/Q_{cap}
KLONDIKE RD.	667A	667										0.00	14.07	28.92	84.81	1192.95		35	700		212.00	912.00	0.95
KLONDIKE RD.	667	666			0.220		0.240		0.030			0.63	14.70	28.92	84.81	1246.23	2	37	740		212.00	952.00	0.58
	666	665			0.160		0.160					0.40	15.10	29.39	83.83	1265.48	1	38	760		212.00	972.00	0.42
PIEKOFF CR.	660	661			0.730							0.81	0.81	20.00	110.77	89.92	3	3	60		0.00	60.00	0.40
	661	663			0.530		0.070					0.69	1.50	20.83	107.57	161.18	3	6	120		0.00	120.00	0.56
WALLSEND AVE.	655	663			0.120		0.320					0.58	0.58	20.00	110.77	64.05	1	1	20		0.00	20.00	0.26
WALLSEND AVE.	663	664										0.00	2.08	21.27	105.92	219.97		7	140		0.00	140.00	0.61
	664	665			0.350		0.160					0.61	2.69	21.66	104.56	281.08	1	8	160		0.00	160.00	0.69
KLONDIKE RD.	665	665A					0.160					0.22	18.01	29.71	83.18	1497.73	1	47	940		212.00	1152.00	0.53
	665A	648										0.00	18.01	29.92	82.75	1490.00	0	47	940		212.00	1152.00	0.96
KLONDIKE RD.	648	647	0.890		0.260		0.160					1.01	40.25	27.90	87.03	3502.76	4	111	2220		212.00	2432.00	0.95
WIMBLEDON ST.	548A	548										0.00	0.00	20.00	110.77	0.00		0	0		0.00	0.00	0.00
	548	547					0.720					1.00	1.00	20.27	109.71	109.80	3	3	60		0.00	60.00	0.52
	547	546					0.230					0.32	1.32	21.18	106.27	140.33		3	60		0.00	60.00	0.52
	546	545					0.530					0.74	2.06	21.33	105.73	217.52	3	6	120		0.00	120.00	0.64
	545	647					0.220					0.31	2.36	22.39	102.08	241.21	1	7	140		0.00	140.00	0.74
KLONDIKE RD.	647	646			0.610							0.68	43.29	28.55	85.61	3705.83	3	121	2420		212.00	2632.00	0.96
	646	645			0.920							1.02	44.31	29.25	84.11	3726.91	3	124	2480		212.00	2692.00	0.85
PENRITH ST.	645	694			0.130							0.14	44.45	29.86	82.87	3684.03	1	110	2200		212.00	2412.00	0.84
BRECHIN CR.	696	695			0.420							0.47	0.47	20.00	110.77	51.73	2	2	40		0.00	40.00	0.40
	695	694			0.340							0.38	0.85	20.59	108.47	91.67	1	3	60		0.00	60.00	0.39
PENRITH ST.	694	693			0.190							0.21	45.51	30.34	81.93	3728.58	1	114	2280		212.00	2492.00	0.87
	693	692			0.320							0.36	45.87	30.58	81.45	3735.74	1	115	2300		212.00	2512.00	0.87
BRECHIN CR.	696	698										0.00	0.00	20.00	110.77	0.00		0	0		0.00	0.00	0.00
BRECHIN CR.	703	698	1.940		0.460							1.59	1.59	20.00	110.77	176.14	3	3	60		0.00	60.00	0.33
EALING ST.	698	697										0.00	1.59	20.74	107.88	171.54		3	60		0.00	60.00	0.33
	697	692			0.290							0.32	1.91	21.41	105.44	201.67	1	4	80		0.00	80.00	0.44
PENRITH ST.	692	691			0.240							0.27	48.05	30.83	80.97	3890.54	1	120	2400		212.00	2612.00	0.87
BRECHIN CR.	704	703	0.860		0.300							0.81	0.81	20.00	110.77	89.92	3	3	60		0.00	60.00	0.59
HASELMERE AVE.	703	702										0.00	0.81	20.74	107.89	87.58		3	60		0.00	60.00	0.33
	702	701			0.290							0.32	1.13	21.41	105.42	119.57	1	4	80		0.00	80.00	0.38
BRECHIN CR.	705	706			0.320							0.36	0.36	20.00	110.77	39.41	1	1	20		0.00	20.00	0.15
PENRITH ST.	707	706			0.680							0.76	0.76	20.00	110.77	83.76	2	2	40		0.00	40.00	0.22
PENRITH ST.	706	701			0.520							0.58	1.69	20.98	107.01	180.87	3	6	120		0.00	120.00	0.45
PENRITH ST.	701	691			0.210							0.23	3.06	21.89	103.77	317.33	1	11	220		0.00	220.00	0.52
HEYSHAM LANE	691	677			0.480							0.53	51.64	31.04	80.58	4161.03	2	133	2660		212.00	2872.00	0.95
WOLISTON CR.	677	676			0.750							0.83	52.47	31.52	79.68	4180.90	2	135	2700		212.00	2912.00	0.97
	676	675										0.00	52.47	32.13	78.59	4123.81		135	2700		212.00	2912.00	0.97
	675	674			0.940		0.230					1.36	53.84	32.20	78.46	4224.15	4	139	2780		212.00	2992.00	0.76
	674	673			0.750		0.110					0.99	54.82	32.76	77.49	4248.18	3	142	2840		212.00	3052.00	0.78
KETTLEWELL WAY	687	688			0.240							0.27	0.27	20.00	110.77	29.56	1	1	20		0.00	20.00	0.17
	688	688A			0.260							0.29	0.56	20.58	108.49	60.32	1	2	40		0.00	40.00	0.34
	688A	689			0.360							0.40	0.96	20.70	108.06	103.34	1	3	60		0.00	60.00	0.51
PALTON ST.	689	673			0.140		0.260					0.52	1.47	21.49	105.16	154.95	2	5	100		0.00	100.00	0.81
WOLISTON CR.	673	672			0.430		0.240					0.81	57.11	33.17	76.79	4385.43	2	149	2980		212.00	3192.00	0.81
WOLISTON CR.	678	681			0.390							0.43	0.43	20.00	110.77	48.04	2	2	40		0.00	40.00	0.48
	681	682										0.00	0.43	21.20	106.18	46.05		2	40		0.00	40.00	0.51
	682	683			0.500							0.56	0.99	21.37	105.60	104.51	3	5	100		0.00	100.00	0.84
KETTLEWELL WAY	687	683			0.190							0.21	0.21	20.00	110.77	23.40	1	1	20		0.00	20.00	0.20
WOLISTON CR.	683	684			0.650							0.72	1.92	22.09	103.08	198.31	4	10	200		0.00	198.31	0.49
PALTON ST.	689	685			0.090							0.10	0.10	20.00	110.77	11.09	1	1	20		0.00	11.09	0.08
	685	684			0.250		0.170					0.51	0.61	20.74	107.90	66.29	1	2	40		0.00	40.00	0.28
WOLISTON CR.	684	670			0.360		0.070					0.50	3.04	22.66	101.20	307.23	3	15	300		0.00	300.00	0.52
FLAMBOROUGH WAY	670	671					0.620					0.86	3.90	23.20	99.47	387.70	2	17	340	21.13	21.13	361.13	0.62
	671	672					0.650					0.90	4.80	24.37	96.01	460.94	3	20	400	24.23	45.36	445.36	0.61
	672	101										0.00	61.91	33.70	75.92	4700.20	1	170	3400		257.36	3657.36	0.94
			UNRESTRICTED REAR YARD FLOWS-PHASE 12 (ha)																				
12D BLK 248	Hydro Ea.	906										0.00	0.00	26.00	91.60	0.00	0	0.00	0	30	30.00	30.00	
12D GOWARD DRIVE	908	907			0.202							0.22	0.22	20.00	110.77	24.88	6	6.00	120	0	0.00	144.88	0.48
	907	906										0.00	0.22	21.01	106.90	24.01	1	7.00	140	0	0.00	164.01	0.58
														22.51									
12D ISHPATINA CRESCENT	804	801										0.00	0.00	20.00	110.77	0.00	0	0.00	0	0	0.00	0.00	0.00
	801	906										0.00	0.00	20.33	109.45	0.00	0	0.00	0	0	0.00	0.00	0.00
														21.47									
12D BLK 246	705	704										0.00	0.00	30.00	82.59	0.00	0	0.00	0	50	50.00	50.00	
FINLAYSON CRESCENT	705	704										0.00	0.00	20.00	110.77	0.00	0	0.00	0	0	0.00	0.00	0.00
	704	701										0.00	0.00	20.10	110.37	0.00	1	1.00	20	0	50.00	70.00	0.63
	701	700			0.180							0.20	0.20	20.55	108.60	21.74	0	1.00	20	0	50.00	91.74	0.79
	700	906										0.00	0.20	21.23	106.10	21.24	0	1.00	20	0	50.00	91.24	0.79
														21.43									
12D GOWARD DRIVE	906	905			0.140							0.16	0.58	22.51	101.67	59.02	3	11.00	220	0	80.00	359.02	0.84
														23.28	99.24								
ISHPATINA CRESCENT	804	803	0.391		0.483							0.75	0.75	20.00	110.77	83.57	1	1.00	20	0	0.00	103.57	1.03
	803	802										0.00	0.75	21.31	105.81	79.83	0	1.00	20	0	0.00	99.83	1.00
	802	905			0.049							0.05	0.81	21.53	105.00	84.94	0	1.00	20	0	0.00	104.94	1.05

Part 2: Sewer data, upstream, downstream

STREET	From	To	SEWER DATA Dia (mm)	Slope %	Q full (l/s)	V full (m/s)	V partial (m/s)	Depth of flow (m)	V surch (m/s)	Length (m)	Flow Time (min)	UPSTREAM Pr. Center Line	Obvert	Obvert Drop	Invert	Cover	DOWNSTREAM Pr. Center Line	Obvert	Obvert Drop	Invert	Cover
KLONDIKE RD.	667A	667	750	0.68	957.73	2.10	2.41	0.587	2.00	63.00	0.50	103.200	98.758		98.008	4.442	101.950	98.330		97.580	3.620
KLONDIKE RD.	667	666	750	1.98	1634.25	3.58	3.80	0.411	2.09	100.00	0.47	101.950	98.330		97.580	3.620	99.550	96.350		95.600	3.200
	666	665	750	4.00	2322.80	5.09	4.87	0.343	2.13	97.50	0.32	99.550	95.750		95.000	3.800	95.000	91.850		91.100	3.150
PIEKOFF CR.	660	661	300	2.20	149.60	2.05	1.93	0.134	0.82	101.60	0.83	100.500	97.441		97.141	3.059	98.500	95.207		94.907	3.293
	661	663	300	4.50	214.03	2.93	3.06	0.162	1.64	78.80	0.45	98.500	95.207		94.907	3.293	94.900	91.660		91.360	3.240
WALLSEND AVE.	655	663	300	0.60	78.14	1.07	0.91	0.104	0.27	73.40	1.14	95.250	92.104		91.804	3.146	94.900	91.664		91.364	3.236
WALLSEND AVE.	663	664	450	0.60	230.39	1.40	1.46	0.256	0.85	32.40	0.38	94.900	91.694		91.244	3.206	94.600	91.500		91.050	3.100
	664	665	450	0.60	230.39	1.40	1.50	0.279	0.97	48.30	0.57	94.600	91.500		91.050	3.100	95.000	91.210		90.760	3.790
KLONDIKE RD.	665	665A	750	3.48	2166.59	4.75	4.93	0.389	2.53	60.70	0.21	95.000	91.252		90.502	3.748	91.800	89.140		88.390	2.660
	665A	648	900	0.40	1194.45	1.82	2.09	0.713	1.75	22.50	0.21	91.800	88.690		87.790	3.110	91.800	88.600		87.700	3.200
KLONDIKE RD.	648	647	1200	0.40	2572.39	2.20	2.51	0.939	2.08	85.00	0.64	91.800	88.606		87.406	3.194	91.400	88.266		87.066	3.134
WIMBLEDON ST.	548A	548	300	0.40	63.80	0.87	0.00	0.000	0.00	14.00	0.27	91.673	88.908		88.608	2.765	91.500	88.852		88.552	2.648
	548	547	375	0.40	115.68	1.01	1.03	0.194	0.53	55.50	0.91	91.500	88.852		88.477	2.648	91.400	88.630		88.255	2.770
	547	546	375	0.40	115.68	1.01	1.03	0.194	0.53	9.00	0.15	91.400	88.590		88.215	2.810	91.430	88.554		88.179	2.876
	546	545	450	0.40	188.11	1.15	1.22	0.261	0.73	73.00	1.06	91.430	88.554		88.104	2.876	91.470	88.262		87.812	3.208
	545	647	450	0.40	188.11	1.15	1.24	0.293	0.85	42.00	0.61	91.470	88.222		87.772	3.248	91.400	88.054		87.604	3.346
KLONDIKE RD.	647	646	1200	0.45	2728.43	2.34	2.68	0.951	2.25	99.00	0.71	91.600	88.266		87.066	3.334	91.650	87.821		86.621	3.830
	646	645	1200	0.60	3150.52	2.70	3.02	0.866	2.31	98.00	0.61	91.650	87.820		86.620	3.830	90.400	87.232		86.032	3.168
PENRITH ST.	645	694	1200	0.50	2869.68	2.46	2.75	0.853	2.07	70.30	0.48	90.400	87.170		85.970	3.230	92.000	86.820		85.620	5.180
BRECHIN CR.	696	695	300	1.00	100.88	1.38	1.33	0.131	0.55	48.70	0.59	92.850	89.936		89.636	2.914	92.505	89.449		89.149	3.056
	695	694	375	0.70	153.03	1.34	1.28	0.164	0.53	87.60	1.09	92.505	89.449		89.074	3.056	92.000	88.836		88.461	3.164
PENRITH ST.	694	693	1200	0.50	2876.02	2.46	2.80	0.866	2.13	36.50	0.25	92.000	86.820		85.620	5.180	91.700	86.638		85.438	5.063
	693	692	1200	0.50	2876.02	2.46	2.78	0.878	2.15	36.50	0.25	91.700	86.638		85.438	5.063	92.000	86.455		85.255	5.545
BRECHIN CR.	696	698	300	1.00	100.88	1.38	0.00	0.000	0.00	33.80	0.41	92.850	89.936		89.636	2.914	93.100	89.598		89.298	3.502
BRECHIN CR.	703	698	375	1.00	183.28	1.61	1.45	0.149	0.53	71.70	0.74	93.100	90.245		89.870	2.855	93.100	89.525		89.150	3.575
EALING ST.	698	697	375	1.00	182.91	1.60	1.45	0.149	0.53	64.00	0.66	93.100	89.461		89.086	3.639	92.350	88.821		88.446	3.529
	697	692	375	1.00	182.91	1.60	1.56	0.175	0.70	53.90	0.56	92.350	88.821		88.446	3.529	92.000	88.282		87.907	3.718
PENRITH ST.	692	691	1200	0.55	3016.39	2.58	2.93	0.866	2.24	32.30	0.21	92.000	86.455		85.255	5.545	91.200	86.277		85.077	4.923
BRECHIN CR.	704	703	300	1.00	100.88	1.38	1.45	0.168	0.82	61.50	0.74	93.000	90.039		89.739	2.961	93.100	89.424		89.124	3.676
HASELMERE AVE.	703	702	375	1.00	182.91	1.60	1.45	0.149	0.53	64.70	0.67	93.100	89.424		89.049	3.676	92.000	88.777		88.402	3.223
	702	701	375	1.36	213.31	1.87	1.75	0.160	0.70	53.00	0.47	92.000	88.775		88.400	3.225	91.440	88.054		87.679	3.386
BRECHIN CR.	705	706	300	1.84	136.84	1.88	1.41	0.076	0.27	109.80	0.98	92.880	89.720		89.420	3.160	90.800	87.700		87.400	3.100
PENRITH ST.	707	706	375	1.00	182.91	1.60	1.34	0.118	0.35	32.20	0.33	90.500	87.912		87.537	2.588	90.800	87.590		87.215	3.210
PENRITH ST.	706	701	450	0.80	266.03	1.62	1.58	0.215	0.73	69.50	0.71	90.800	87.590		87.140	3.210	91.440	87.034		86.584	4.406
PENRITH ST.	701	691	450	2.00	420.63	2.56	2.61	0.233	1.34	39.20	0.25	91.440	87.034		86.584	4.406	91.200	86.250		85.800	4.950
HEYSHAM LANE	691	677	1200	0.55	3016.39	2.58	2.96	0.939	2.46	75.40	0.49	91.300	86.234		85.034	5.066	91.300	85.819		84.619	5.481
WOLISTON CR.	677	676	1200	0.55	3016.39	2.58	2.97	0.951	2.49	93.70	0.60	91.300	85.759		84.559	5.541	90.160	85.244		84.044	4.916
	676	675	1200	0.55	3016.39	2.58	2.97	0.951	2.49	11.30	0.07	90.160	85.214		84.014	4.946	90.150	85.152		83.952	4.998
	675	674	1350	0.50	3937.30	2.66	2.89	0.892	2.02	89.60	0.56	90.150	85.152		83.802	4.998	89.190	84.704		83.354	4.486
	674	673	1350	0.50	3937.30	2.66	2.91	0.905	2.07	65.80	0.41	89.190	84.704		83.354	4.486	88.400	84.375		83.025	4.025
KETTLEWELL WAY	687	688	300	1.40	119.32	1.64	1.25	0.082	0.27	57.20	0.58	90.940	87.878		87.578	3.062	90.600	87.078		86.778	3.522
	688	688A	300	1.40	119.37	1.64	1.51	0.119	0.55	11.00	0.11	90.600	87.027		86.727	3.573	90.000	86.873		86.573	3.127
	688A	689	300	1.38	118.47	1.62	1.64	0.152	0.82	77.10	0.79	90.000	86.823		86.523	3.177	88.900	85.760		85.460	3.140
PALTON ST.	689	673	300	1.50	123.47	1.69	1.88	0.207	1.37	78.50	0.77	88.900	85.422		85.122	3.478	88.400	84.246		83.946	4.154
WOLISTON CR.	673	672	1350	0.50	3937.30	2.66	2.96	0.933	2.16	84.20	0.53	88.400	84.375		83.025	4.025	87.200	83.954		82.604	3.246
WOLISTON CR.	678	681	300	0.68	82.88	1.14	1.15	0.146	0.55	81.90	1.20	91.228	88.795		88.495	2.433	91.920	88.242		87.942	3.678
	681	682	300	0.60	78.14	1.07	1.10	0.152	0.55	10.50	0.16	91.920	88.192		87.892	3.728	91.790	88.129		87.829	3.661
	682	683	300	1.39	119.07	1.63	1.83	0.213	1.37	70.70	0.72	91.790	88.079		87.779	3.711	90.750	87.094		86.794	3.656
KETTLEWELL WAY	687	683	300	1.02	101.99	1.40	1.10	0.091	0.27	55.00	0.66	90.940	87.646		87.346	3.294	90.750	87.084		86.784	3.666
WOLISTON CR.	683	684	450	1.88	408.04	2.49	2.48	0.224	1.21	84.90	0.57	90.750	87.094		86.644	3.656	88.680	85.496		85.046	3.184
PALTON ST.	689	685	375	0.60	141.68	1.24	0.81	0.069	0.10	55.00	0.74	88.900	86.185		85.810	2.715	88.810	85.855		85.480	2.955
	685	684	375	0.60	141.68	1.24	1.08	0.137	0.35	64.80	0.87	88.810	85.855		85.480	2.955	88.680	85.466		85.091	3.214
WOLISTON CR.	684	670	525	1.64	574.56	2.57	2.62	0.272	1.34	84.20	0.55	88.680	85.496		84.971	3.184	87.200	84.115		83.590	3.085
FLAMBOROUGH WAY	670	671	750	0.25	580.71	1.27	1.32	0.434	0.79	89.00	1.16	87.200	84.160		83.410	3.040	87.130	83.938		83.188	3.193
	671	672	900	0.15	732.66	1.12	1.16	0.512	0.68	109.00	1.63	87.130	83.968		83.068	3.162	87.200	83.804		82.904	3.396
	672	101	1350	0.49	3897.72	2.64	3.02	1.042	2.48	79.20	0.50	87.200	83.884		82.534	3.316	87.100	83.496		82.146	3.604
12D BLK 248	Hydro Ea.	906																			
12D GOWARD DRIVE	908	907	450	1.05	304.78	1.86	1.86	0.219	0.88	112.00	1.01	102.20	99.400		98.943	2.80	101.34	98.224		97.767	3.12
	907	906	525	0.40	283.76	1.27	1.33	0.288	0.73	114.87	1.51	101.34	98.197	0.03	97.664	3.14	100.70	97.738		97.204	2.96
12D ISHPATINA CRESCENT	804	801	300	0.40	63.80	0.87	0.00	0.000	0.00	17.43	0.33	100.96	98.060		97.755	2.90	100.96	97.990		97.685	2.97
	801	906	300	0.40	63.80	0.87	0.00	0.000	0.00	59.50	1.13	100.96	97.950	0.04	97.645	3.01	100.70	97.712		97.407	2.99
12D BLK 246	705	704																			
FINLAYSON CRESCENT	705	704	300	1.20	110.51	1.51	0.00	0.000	0.00	8.98	0.10	101.47	98.670		98.365	2.80	101.33	98.562		98.257	2.77
	704	701	300	1.20	110.51	1.51	1.60	0.174	0.96	41.34	0.45	101.33	98.522	0.04	98.217	2.81	100.77	98.026		97.721	2.74
	701	700	375	0.40	115.68	1.01	1.12	0.255	0.80	40.92	0.67	100.77	98.026		97.645	2.74	100.62	97.862		97.481	2.76
	700	906	375	0.40	115.68	1.01	1.13	0.251	0.80	12.73	0.21	100.62	97.712	0.15	97.331	2.91	100.70	97.662		97.281	3.04
12D GOWARD DRIVE	906	905	600	0.45	429.70	1.47	1.66	0.421	1.23	67.57	0.76	100.70	97.662		97.052	3.04	100.66	97.357		96.748	3.30
ISHPATINA CRESCENT	804	803	375	0.30	100.18	0.88	1.00	0.324	0.91	68.89	1.31	100.96	98.160		97.779	2.80	100.87	97.953		97.572	2.92
	803	802	375	0.30	100.18	0.88	1.01	0.309	0.88	11.88	0.23	100.87	97.913	0.04	97.532	2.96	100.86	97.878		97.497	2.98
	802	905	375	0.30	100.18	0.88	1.00	0.331	0.92	67.47	1.28	100.86	97.838	0.04	97.457	3.02	100.66	97.635		97.254	3.02

Part 3: Head loss calculation, HGL elevations, cover

STREET	From	To	HEAD LOSS CALCULATION f	L / D	K FRICT	V^2 / 2g (m)	Straight	Expansion	Bend	Major Loss (m)	Minor Loss (m)	Total Losses (m)	Applied Losses (m)	1:100 YR HGL ELEVATIONS Upstr.	Downs.	COVER Top Foot.- HGL Upstr.	Downs.	COVER - HGL Centerline Upstr.	Downs.
KLONDIKE RD.	667A	667	0.023	82.677	1.905	0.296	0.044			0.564	0.044	0.608	0.000	98.758	98.330	1.742	0.920	4.442	3.620
KLONDIKE RD.	667	666	0.023	131.234	3.024	0.734	0.110			2.221	0.110	2.331	0.000	98.330	96.350	0.920	0.500	3.620	3.200
	666	665	0.023	127.953	2.948	1.210	0.182			3.568	0.182	3.749	0.000	95.750	91.850	1.100	0.450	3.800	3.150
PIEKOFF CR.	660	661	0.031	333.333	10.425	0.034	0.005			0.359	0.005	0.365	0.365	97.441	95.207	0.359	0.593	3.059	3.293
	661	663	0.031	258.530	8.085	0.138		0.138	0.141	1.115	0.279	1.394	1.394	95.207	91.694	0.593	0.506	3.293	3.206
WALLSEND AVE.	655	663	0.031	240.814	7.531	0.004	0.001	0.004		0.029	0.004	0.033	0.033	92.104	91.694	0.446	0.506	3.146	3.206
WALLSEND AVE.	663	664	0.027	70.866	1.936	0.037	0.006			0.072	0.006	0.077	0.077	91.694	91.500	0.506	0.400	3.206	3.100
	664	665	0.027	105.643	2.886	0.048		0.048	0.049	0.140	0.098	0.238	0.238	91.500	91.252	0.400	1.048	3.100	3.748
KLONDIKE RD.	665	665A	0.023	79.659	1.836	1.239	0.186	1.239		2.274	1.424	3.698	0.000	91.252	89.140	1.048	-0.040	3.748	2.660
	665A	648	0.022	24.606	0.534	0.222	0.033	0.222		0.119	0.256	0.374	0.000	88.690	88.600	0.410	0.500	3.110	3.200
KLONDIKE RD.	648	647	0.020	69.718	1.374	0.321	0.048			0.441	0.048	0.489	0.000	88.606	88.266	0.494	0.434	3.194	3.134
WIMBLEDON ST.	548A	548	0.031	45.932	1.437	0.000				0.000	0.000	0.000	0.000	88.908	88.852	0.065	-0.052	2.765	2.648
	548	547	0.029	145.669	4.229	0.054			0.004	0.227	0.004	0.232	0.000	88.852	88.630	-0.052	0.070	2.648	2.770
	547	546	0.029	23.622	0.686	0.054		0.054	0.004	0.037	0.058	0.095	0.000	88.590	88.554	0.110	0.176	2.810	2.876
	546	545	0.027	159.668	4.362	0.076	0.011			0.330	0.011	0.341	0.000	88.554	88.262	0.176	0.508	2.876	3.208
	545	647	0.027	91.864	2.510	0.078		0.078	0.080	0.197	0.158	0.355	0.000	88.222	88.054	0.548	0.646	3.248	3.346
KLONDIKE RD.	647	646	0.020	81.201	1.600	0.367	0.055			0.588	0.055	0.643	0.000	88.266	87.821	0.634	1.129	3.334	3.830
	646	645	0.020	80.381	1.584	0.466			0.476	0.738	0.476	1.214	0.000	87.820	87.232	1.130	0.468	3.830	3.168
PENRITH ST.	645	694	0.020	57.661	1.136	0.387	0.058			0.440	0.058	0.498	0.000	87.170	86.820	0.530	2.480	3.230	5.180
BRECHIN CR.	696	695	0.031	159.777	4.997	0.090		0.090	0.025	0.450	0.115	0.565	0.000	89.936	89.449	0.214	0.356	2.914	3.056
	695	694	0.029	229.921	6.675	0.083		0.083	0.085	0.554	0.168	0.722	0.000	89.449	88.836	0.356	0.464	3.056	3.164
PENRITH ST.	694	693	0.020	29.938	0.590	0.232			0.014	0.137	0.014	0.151	0.151	88.089	87.938	1.211	1.062	3.911	3.762
	693	692	0.020	29.938	0.590	0.236	0.035			0.139	0.035	0.175	0.175	87.938	87.763	1.062	1.537	3.762	4.237
BRECHIN CR.	696	698	0.031	110.892	3.468	0.000				0.000	0.000	0.000	0.000	89.936	89.598	0.214	0.802	2.914	3.502
BRECHIN CR.	703	698	0.029	188.189	5.464	0.107			0.110	0.587	0.110	0.697	0.000	90.245	89.525	0.155	0.875	2.855	3.575
EALING ST.	698	697	0.029	167.979	4.877	0.107	0.016			0.524	0.016	0.540	0.000	89.461	88.821	0.939	0.829	3.639	3.529
	697	692	0.029	141.470	4.107	0.124		0.124	0.126	0.509	0.250	0.760	0.000	88.821	88.282	0.829	1.018	3.529	3.718
PENRITH ST.	692	691	0.020	26.493	0.522	0.255			0.260	0.133	0.260	0.394	0.394	87.763	87.369	1.537	1.131	4.237	3.831
BRECHIN CR.	704	703	0.031	201.772	6.310	0.107		0.107	0.110	0.677	0.217	0.894	0.000	90.039	89.424	0.261	0.976	2.961	3.676
HASELMERE AVE.	703	702	0.029	169.816	4.930	0.107	0.016			0.530	0.016	0.546	0.000	89.424	88.777	0.976	0.523	3.676	3.223
	702	701	0.029	139.108	4.039	0.157		0.157	0.160	0.634	0.317	0.951	0.000	88.775	88.054	0.525	0.686	3.225	3.386
BRECHIN CR.	705	706	0.031	360.236	11.266	0.004		0.004	0.004	0.043	0.008	0.051	0.051	89.720	87.886	0.460	0.214	3.160	2.914
PENRITH ST.	707	706	0.029	84.514	2.454	0.006	0.001	0.006		0.015	0.007	0.023	0.023	87.912	87.886	-0.112	0.214	2.588	2.914
PENRITH ST.	706	701	0.027	152.012	4.153	0.027	0.004			0.113	0.004	0.117	0.117	87.886	87.769	0.214	0.971	2.914	3.671
PENRITH ST.	701	691	0.027	85.739	2.342	0.092		0.092	0.093	0.214	0.185	0.399	0.399	87.769	87.369	0.971	1.131	3.671	3.831
HEYSHAM LANE	691	677	0.020	61.844	1.218	0.309			0.315	0.376	0.315	0.691	0.691	87.369	86.679	1.231	1.921	3.931	4.621
WOLISTON CR.	677	676	0.020	76.854	1.514	0.317			0.089	0.480	0.089	0.569	0.569	86.679	86.110	1.921	1.350	4.621	4.050
	676	675	0.020	9.268	0.183	0.317		0.317	0.089	0.058	0.406	0.464	0.464	86.110	85.646	1.350	1.804	4.050	4.504
	675	674	0.019	65.325	1.237	0.209	0.031			0.259	0.031	0.290	0.290	85.646	85.356	1.804	1.134	4.504	3.834
	674	673	0.019	47.973	0.909	0.218	0.033			0.198	0.033	0.230	0.230	85.356	85.125	1.134	0.575	3.834	3.275
KETTLEWELL WAY	687	688	0.031	187.664	5.869	0.079			0.022	0.464	0.022	0.487	0.000	87.878	87.078	0.362	0.822	3.062	3.522
	688	688A	0.031	36.089	1.129	0.117			0.033	0.132	0.033	0.164	0.000	87.027	86.873	0.873	0.427	3.573	3.127
	688A	689	0.031	252.953	7.911	0.034			0.035	0.273	0.035	0.308	0.308	86.823	86.090	0.477	0.110	3.177	2.810
PALTON ST.	689	673	0.031	257.546	8.055	0.096		0.096	0.098	0.771	0.193	0.965	0.965	86.090	85.125	0.110	0.575	2.810	3.275
WOLISTON CR.	673	672	0.019	61.388	1.163	0.238			0.243	0.277	0.243	0.519	0.519	85.125	84.606	0.575	-0.106	3.275	2.594
WOLISTON CR.	678	681	0.031	268.701	8.404	0.068			0.019	0.571	0.019	0.590	0.000	88.795	88.242	-0.267	0.978	2.433	3.678
	681	682	0.031	34.449	1.077	0.061			0.017	0.066	0.017	0.083	0.000	88.192	88.129	1.028	0.961	3.728	3.661
	682	683	0.031	231.955	7.254	0.170	0.026	0.170		1.235	0.196	1.431	0.000	88.079	87.094	1.011	0.956	3.711	3.656
KETTLEWELL WAY	687	683	0.031	180.446	5.643	0.061		0.061	0.063	0.346	0.124	0.470	0.000	87.646	87.084	0.594	0.966	3.294	3.666
WOLISTON CR.	683	684	0.027	185.696	5.073	0.313	0.047	0.313		1.588	0.360	1.948	0.000	87.094	85.496	0.956	0.484	3.656	3.184
PALTON ST.	689	685	0.029	144.357	4.191	0.033	0.005			0.140	0.005	0.145	0.000	86.185	85.855	0.015	0.255	2.715	2.955
	685	684	0.029	170.079	4.938	0.006		0.006	0.006	0.031	0.013	0.044	0.044	85.855	85.496	0.255	0.484	2.955	3.184
WOLISTON CR.	684	670	0.026	157.855	4.097	0.092		0.092	0.094	0.376	0.186	0.562	0.562	85.496	84.816	0.484	-0.316	3.184	2.384
FLAMBOROUGH WAY	670	671	0.023	116.798	2.691	0.032	0.005	0.032		0.086	0.037	0.123	0.123	84.816	84.693	-0.316	-0.263	2.384	2.437
	671	672	0.022	119.204	2.585	0.023	0.004	0.023		0.061	0.027	0.088	0.088	84.693	84.606	-0.263	-0.106	2.437	2.594
	672	101	0.019	57.743	1.094	0.312		0.312	0.319	0.342	0.631	0.973	0.973	84.606	83.633	-0.106	0.767	2.594	3.467
12D BLK 248	Hydro Ea.	906																	
12D GOWARD DRIVE	908	907	0.027	244.969	6.693	0.176	0.026	0.176		1.178	0.202	1.380	0.000	99.400	98.224	0.398	0.714	2.800	3.116
	907	906	0.026	215.354	5.589	0.091	0.014	0.091		0.507	0.104	0.612	0.000	98.197	97.738	0.741	0.561	3.143	2.963
12D ISHPATINA CRESCENT	804	801	0.031	57.185	1.788	0.000				0.000	0.000	0.000	0.000	98.0[illegible]	97.990	0.498	0.568	2.900	2.970
	801	906	0.031	195.210	6.105	0.000				0.000	0.000	0.000	0.000	97[illegible]50	97.712	0.608	0.586	3.010	2.988
12D BLK 246	705	704																	
FINLAYSON CRESCENT	705	704	0.031	29.462	0.921	0.000				0.000	0.000	0.000	0.00[illegible]	98.670	98.562	0.398	0.366	2.800	2.768
	704	701	0.031	135.630	4.242	0.130		0.130		0.553	0.130	0.683	[illegible]000	98.522	98.026	0.406	0.342	2.808	2.744
	701	700	0.029	107.402	3.118	0.064			0.003	0.199	0.003	0.201	0.000	98.026	97.862	0.342	0.356	2.744	2.758
	700	906	0.029	33.412	0.970	0.065		0.065	0.066	0.063	0.131	0.194	0.000	97.712	97.662	0.506	0.636	2.908	3.038
12D GOWARD DRIVE	906	905	0.025	110.843	2.751	0.141	0.021			0.388	0.021	0.4[illegible]9	0.000	97.662	97.357	0.636	0.901	3.038	3.303
ISHPATINA CRESCENT	804	803	0.029	180.814	5.250	0.051			0.014	0.268	0.014	0.282	0.000	98.160	97.953	0.398	0.515	2.800	2.917
	803	802	0.029	31.181	0.905	0.052			0.014	0.047	0.014	0.061	0.000	97.913	97.878	0.555	0.580	2.957	2.982
	802	905	0.029	177.087	5.141	0.050		0.050	0.051	0.260	0.10[illegible]	0.362	0.000	97.838	97.635	0.620	0.623	3.022	3.025

Connection at MH 907
U/S HGL = 98.225. D/S HGL = 98.197

J.L. Richards
& Associates Limited
864 Lady Ellen Place
Ottawa, ON Canada
K1Z 5M2
Tel: 613 728 3571
Fax: 613 728 6012

CITY OF OTTAWA

MINTO DEVELOPMENTS INC.

MORGAN'S GRANT SUBDIVISION - PHASE 12D

JLR NO. 17732

STORM SEWER DESIGN SHEET
Rev. No. 0: MOE Submission for Phase 12D - May 11/ 2005
Rev. No. 1: City Comments for Phase 12D - July 11/ 2005
Rev. No. 2: City Comments for Phase 12D - August 11/ 2006
Rev. No. 3: Issued with Phase 12D SWM Report - August 24/ 2007
Designed by: J.B.
Checked by: L.J./G.F.

DESIGN PARAMETERS
Manning's Coefficient, n = 0.013
IDF CURVE = 5 year

STREET	M.H. #		AREAS FOR "R" in (ha)							PEAK FLOW COMPUTATION					SEWER							UPSTREAM					DOWNSTREAM				COMMENTS
	FROM	TO	0.2	0.3	0.4	0.45	0.5	0.6	0.7	2.78AR	2.78AR (CUM.)	TIME (min.)	INTENS. (mm/hr)	PEAK FL. (L/s)	DIA. (mm)	SLOPE (%)	CAPAC. (L/s)	VEL. (m/s)	LENGTH (m)	FL.TIME (min.)	RESIDUAL CAP. (L/s)	Pr. Center Line	Obvert Drop	Obvert	Invert	Cover	Pr. Center Line	Obvert	Invert	Cover	
BLK 248	Hydro Ea.	906	0.720		0.118					0.53	0.53	*26.00*	59.35	31.54	-	-	-	-	-	-	-										**Flow controlled to 30 L/s**
GOWARD DRIVE	908	907			0.702		1.216			2.47	2.47	*20.00*	70.25	173.58	450	1.05	304.76	1.86	112.00	1.01	131.18	102.20		99.400	98.943	2.80	101.34	98.224	97.767	3.12	**PHASE 12D**
	907	906			0.203					0.23	2.70	21.01	68.12	213.69	525	0.40	283.74	1.27	114.87	1.51	70.05	101.34	0.027	98.197	97.664	3.14	100.70	97.738	97.204	2.96	**+ Fixed flowrate from Blks 247/248 (30 L/s)**
												22.51																			
ISHPATINA CRESCENT	804	801								0.00	0.00	*20.00*	70.25	0.00	300	0.40	63.80	0.87	17.43	0.33	63.80	100.96		98.060	97.755	2.90	100.96	97.990	97.685	2.97	**PHASE 12D**
	801	906								0.00	0.00	20.33	69.53	0.00	300	0.40	63.80	0.87	59.50	1.13	63.80	100.96	0.040	97.950	97.645	3.01	100.70	97.712	97.407	2.99	**PHASE 12D**
												21.47																			
BLK 246	705	704	1.157		0.191					0.86	0.86	*30.00*	53.93	46.14	-	-	-	-	-	-	-										**Flow controlled to 50 L/s**
FINLAYSON CRESCENT	705	704								0.00	0.00	*20.00*	70.25	50.00	300	1.20	110.50	1.51	8.98	0.10	60.50	101.47		98.670	98.365	2.80	101.33	98.562	98.257	2.77	**+ Fixed flowrate from Blk 246 (50 L/s)**
	704	701			0.360					0.40	0.40	20.10	70.03	78.04	300	1.20	110.50	1.51	41.34	0.45	32.46	101.33	0.040	98.522	98.217	2.81	100.77	98.026	97.721	2.74	**PHASE 12D**
	701	700			0.180					0.20	0.60	20.55	69.06	91.47	375	0.40	115.67	1.01	40.92	0.67	24.21	100.77		98.026	97.645	2.74	100.62	97.862	97.481	2.76	**PHASE 12D**
	700	906								0.00	0.60	21.23	67.67	90.63	375	0.40	115.67	1.01	12.73	0.21	25.04	100.62	0.150	97.712	97.331	2.91	100.70	97.662	97.281	3.04	**PHASE 12D**
												21.44																			
GOWARD DRIVE	906	905			0.837					0.93	4.23	22.51	65.18	355.56	600	0.45	429.67	1.47	67.57	0.76	74.12	100.70		97.662	97.052	3.04	100.66	97.357	96.748	3.30	**PHASE 12D**
												23.28																			
ISHPATINA CRESCENT	804	803	0.391		0.823					1.13	1.13	*20.00*	70.25	79.56	375	0.30	100.18	0.88	68.89	1.31	20.61	100.96		98.160	97.779	2.80	100.87	97.953	97.572	2.92	**PHASE 12D**
	803	802								0.00	1.13	21.31	67.51	76.46	375	0.30	100.18	0.88	11.88	0.23	23.72	100.87	0.040	97.913	97.532	2.96	100.86	97.878	97.497	2.98	**PHASE 12D**
	802	905			0.049					0.05	1.19	21.53	67.06	79.60	375	0.30	100.18	0.88	67.47	1.28	20.57	100.86	0.040	97.838	97.457	3.02	100.66	97.635	97.254	3.02	**PHASE 12D**
												22.81																			
GOWARD DRIVE	905	904			0.415					0.46	5.88	23.28	63.79	454.85	600	0.70	535.90	1.84	48.61	0.44	81.04	100.66	0.041	97.316	96.707	3.34	100.91	96.976	96.367	3.93	**PHASE 12D**
												23.72																			
FINLAYSON CRESCENT	705	703								0.00	0.00	*20.00*	70.25	0.00	300	0.35	59.68	0.82	77.42	1.58	59.68	101.47		98.670	98.365	2.80	101.33	98.399	98.094	2.93	**PHASE 12D**
	703	702								0.00	0.00	21.58	66.97	0.00	300	0.35	59.68	0.82	12.38	0.25	59.68	101.33	0.040	98.359	98.054	2.97	101.23	98.316	98.011	2.91	**PHASE 12D**
12D	702	904			0.548					0.61	0.61	21.83	66.47	40.51	300	0.45	67.67	0.93	86.27	1.55	27.16	101.23	0.040	98.276	97.971	2.95	100.91	97.887	97.583	3.02	**PHASE 12D**
												23.38																			
GOWARD DRIVE	904	903			0.552					0.61	7.10	23.72	63.02	527.41	600	1.20	701.66	2.40	77.00	0.53	174.24	100.91	0.963	96.013	95.404	4.90	99.50	95.089	**94.480**	4.41	PHASE 12C
	903	902								0.00	7.10	24.25	62.11	520.99	600	1.73	842.47	2.89	40.00	0.23	321.49	99.50	0.100	94.990	94.380	4.51	97.59	94.298	93.688	3.29	PHASE 12C
	902	901			0.355					0.39	7.49	24.48	61.73	542.64	600	1.84	868.37	2.98	40.00	0.22	325.73	97.59	0.600	93.698	93.088	3.89	95.75	92.962	92.353	2.79	PHASE 12C
	901	900			0.417					0.46	7.96	24.71	61.37	568.35	675	0.85	807.97	2.19	72.50	0.55	239.62	95.75	0.465	92.497	91.812	3.25	94.95	91.882	91.196	3.07	PHASE 12C
	900	114								0.00	7.96	25.26	60.48	561.32	750	1.09	1212.49	2.66	36.90	0.23	651.16	94.95	0.293	91.589	90.827	3.36	94.69	91.187	**90.425**	3.50	PHASE 12C
												25.49																			
TESKIWA CRESCENT	903	602			0.496					0.55	0.55	*20.00*	70.25	38.75	300	0.50	71.33	0.98	86.90	1.48	32.58	99.50		96.575	96.270	2.93	98.94	96.141	95.836	2.80	PHASE 12C
	602	601			0.233					0.26	0.81	21.48	67.16	54.44	300	0.75	87.36	1.20	12.30	0.17	32.92	98.94	0.040	96.101	95.796	2.84	98.79	96.008	95.703	2.78	PHASE 12C
	601	600			0.339					0.38	1.19	21.65	66.82	79.36	300	2.65	164.21	2.25	69.00	0.51	84.85	98.79	0.040	95.968	95.663	2.82	96.93	94.140	93.835	2.79	PHASE 12C
	600	116								0.00	1.19	22.16	65.83	78.19	300	3.23	181.29	2.48	64.50	0.43	103.11	96.93	0.266	93.874	93.569	3.06	95.50	91.790	**91.486**	3.71	PHASE 12C
HALTON TERRACE	116	115			0.321					0.36	1.54	22.60	65.02	100.43	525	0.70	375.35	1.68	41.10	0.41	274.92	95.50	0.279	91.531	90.998	3.97	95.30	91.244	90.710	4.06	PHASE 12A
	115	114			0.594					0.66	2.21	23.00	64.28	141.74	525	0.70	375.35	1.68	40.80	0.40	233.61	95.30	0.040	91.204	90.670	4.10	94.65	90.918	90.385	3.73	PHASE 12A
												23.41																			
HALTON TERRACE	114	113			0.478					0.53	10.69	25.49	60.12	722.98	825	0.60	1159.90	2.10	46.10	0.37	436.92	94.65	0.040	90.878	90.040	3.77	94.05	90.601	89.763	3.45	PHASE 12A
	113	112A			0.460					0.51	11.21	25.86	59.56	747.44	825	0.65	1207.26	2.19	33.00	0.25	459.82	94.05	0.030	90.571	89.733	3.48	94.10	90.357	89.519	3.74	PHASE 12A
	112A	112								1.61	12.82	26.11	59.18	838.48	825	0.65	1207.26	2.19	31.00	0.24	368.79	94.10		90.357	89.519	3.74	94.25	90.155	89.317	4.09	+School Flow (2.78xAC = 1.61) from CCL
												26.11																			
EDGEMOORE CRESCENT	901	504	0.513		0.249					0.56	0.56	*20.00*	70.25	39.49	300	0.50	71.33	0.98	69.30	1.18	31.84	95.75		93.150	92.845	2.60	95.61	92.804	92.499	2.81	PHASE 12C
	504	503								0.00	0.56	21.18	67.76	38.09	300	1.00	100.87	1.38	12.30	0.15	62.78	95.61	0.040	92.764	92.459	2.85	95.51	92.641	92.336	2.87	PHASE 12C
	503	502	0.408		0.599					0.89	1.46	21.33	67.46	98.16	375	0.85	168.62	1.48	98.00	1.10	70.46	95.51		92.641	92.260	2.87	94.60	91.808	91.427	2.79	PHASE 12C
	502	501	0.282		0.987					1.25	2.71	22.43	65.32	176.99	525	0.35	265.41	1.19	93.00	1.30	88.42	94.60		91.808	91.274	2.79	94.44	91.482	90.949	2.96	PHASE 12C
	501	500								0.00	2.71	23.74	62.99	170.65	525	0.35	265.41	1.19	12.30	0.17	94.76	94.44	0.040	91.442	90.909	3.00	94.38	91.399	90.866	2.98	PHASE 12C
	500	112			0.586					0.65	3.36	23.91	62.69	210.70	525	1.23	497.55	2.23	79.30	0.59	286.85	94.38	0.134	91.265	90.732	3.12	94.25	90.290	**89.756**	3.96	PHASE 12C
												24.51																			
HALTON TERRACE	112	111			0.170					0.19	16.37	26.11	59.18	1048.57	825	1.00	1497.43	2.71	76.70	0.47	448.85	94.25	0.030	90.125	89.287	4.12	92.51	89.358	88.520	3.15	PHASE 12A
												26.58																			

STREET	M.H. #		AREAS FOR "R" in (ha)							PEAK FLOW COMPUTATION					SEWER							UPSTREAM					DOWNSTREAM				COMMENTS
	FROM	TO	0.2	0.3	0.4	0.45	0.5	0.6	0.7	2.78AR	2.78AR (CUM.)	TIME (min.)	INTENS. (mm/hr)	PEAK FL. (L/s)	DIA. (mm)	SLOPE (%)	CAPAC. (L/s)	VEL. (m/s)	LENGTH (m)	FL.TIME (min.)	RESIDUAL CAP. (L/s)	Pr. Center Line	Obvert Drop	Obvert	Invert	Cover	Pr. Center Line	Obvert	Invert	Cover	
MUSKEGO CRESCENT	402	111			0.222					0.25	0.25	*20.00*	70.25	17.34	300	0.87	94.09	1.29	78.77	1.02	76.75	92.06		89.473	89.168	2.59	92.51	88.788	88.483	3.72	PHASE 12B
												21.02																		
HALTON TERRACE	111	110			0.200					2.46	19.08	26.58	58.48	1195.63	825	1.20	1640.35	2.97	72.40	0.41	444.72	92.51	0.017	88.771	87.933	3.74	91.00	87.902	87.064	3.10	+School Flow (2.78xAC = 2.24) from CCL
	110	109			0.579					0.64	19.72	26.99	57.90	1221.74	825	1.20	1640.35	2.97	81.90	0.46	418.61	91.00	0.560	87.342	86.504	3.66	90.10	86.359	85.521	3.74	PHASE 12A
												27.45																		
MUSKEGO CRESCENT	402	401			0.236					0.26	0.26	*20.00*	70.25	18.44	300	0.80	90.22	1.24	13.84	0.19	71.79	92.06		89.179	88.874	2.88	91.96	89.068	88.763	2.89	PHASE 12B
	401	400	0.334		0.427					0.66	0.92	20.19	69.84	64.46	300	2.30	153.08	2.10	74.30	0.59	88.62	91.96	0.040	89.028	88.723	2.93	90.24	87.317	87.012	2.92	PHASE 12B
	400	303	0.195		0.976					1.19	2.12	20.78	68.59	145.19	375	1.74	241.26	2.12	70.02	0.55	96.07	90.24		87.317	86.936	2.92	88.84	86.099	85.718	2.74	PHASE 12B
												21.33																		
DUNOLLIE CRESCENT	304	303					0.154			0.21	0.21	*20.00*	70.25	15.04	300	0.30	55.25	0.76	11.22	0.25	40.21	88.65		86.134	85.829	2.52	88.84	86.100	85.796	2.74	PHASE 12B
												20.25																		
DUNOLLIE CRESCENT	303	109			0.240					0.27	2.60	21.33	67.46	175.25	525	0.36	269.18	1.20	85.61	1.18	93.93	88.84		86.099	85.565	2.74	90.10	85.791	85.257	4.31	PHASE 12B
												22.51																		
HALTON TERRACE	109	108			0.130	0.460	0.147			0.92	23.24	27.45	57.25	1410.62	825	1.20	1640.35	2.97	66.80	0.37	229.73	90.10		85.791	84.953	4.31	88.53	84.990	84.151	3.54	PHASE 12A
												27.82																		
DUNOLLIE CRESCENT	302A	302	0.216				0.085			0.24	0.24	*20.00*	70.25	16.74	300	0.50	71.33	0.98	15.18	0.26	54.59	88.53		85.387	85.082	3.14	88.45	85.311	85.006	3.14	PHASE 12B
	302	301					0.716			1.00	1.23	20.26	69.69	85.96	375	0.35	108.20	0.95	69.40	1.22	22.24	88.45		85.311	84.930	3.14	88.20	85.068	84.687	3.13	PHASE 12B
	301	300					0.288			0.40	1.63	21.48	67.17	109.74	375	0.40	115.67	1.01	9.99	0.16	5.94	88.20	0.040	85.028	84.647	3.17	88.27	84.988	84.607	3.28	PHASE 12B
	300	108								0.00	1.63	21.64	66.84	109.21	450	0.20	133.01	0.81	90.70	1.87	23.80	88.27		84.988	84.531	3.28	88.53	84.807	84.350	3.72	PHASE 12B
												23.51																		
HALTON TERRACE	108	107				0.500				0.63	25.50	27.82	56.74	1526.82	1050	0.45	1910.95	2.14	31.70	0.25	384.13	88.53		84.807	83.740	3.72	88.75	84.664	83.597	4.09	PHASE 12A
	107	106								0.00	25.50	28.07	56.40	1518.28	1050	0.45	1910.95	2.14	43.10	0.34	392.67	88.75	0.040	84.624	83.557	4.13	88.05	84.430	83.363	3.62	PHASE 12A
												28.40																		
McBRIEN STREET	203	202			0.130					0.14	0.14	*20.00*	70.25	10.16	300	1.52	124.37	1.70	98.50	0.96	114.21	90.71		87.706	87.401	3.00	89.09	86.209	85.904	2.88	PHASE 12A
	202	201					0.690			0.96	1.10	20.96	68.21	75.28	375	0.85	168.62	1.48	74.40	0.84	93.35	89.09		86.209	85.828	2.88	88.60	85.576	85.195	3.02	PHASE 12A
	201	200								0.00	1.10	21.80	66.53	73.43	375	0.85	168.62	1.48	12.70	0.14	95.20	88.60	0.030	85.546	85.165	3.05	88.35	85.438	85.057	2.91	PHASE 12A
	200	106								0.00	1.10	21.94	66.25	73.12	375	1.75	241.95	2.12	20.90	0.16	168.83	88.35	0.030	85.408	85.027	2.94	87.92	85.043	84.662	2.88	PHASE 12A
												22.11																		
HALTON TERRACE	106	105				0.447				0.56	27.16	28.40	55.95	1599.90	1050	0.55	2112.63	2.36	41.00	0.29	512.74	88.05	0.040	84.390	83.323	3.66	87.25	84.165	83.098	3.09	PHASE 12A
	105	Ex. 101	0.465		0.312	0.652	0.084			1.54	28.70	28.69	55.57	1675.06	1200	0.40	2572.29	2.20	88.70	0.67	897.23	87.05	0.215	83.950	82.730	3.10	87.10	83.595	82.376	3.51	PHASE 12A
												29.36																		

$\Sigma = 8.885 ha$

Total area = 24.837ha

CITY OF OTTAWA
MORGAN'S GRANT PHASE 12D SUBDIVISION
MINTO DEVELOPMENTS INC.

Designed by: J.B.
Checked by: G.F.
Date: August 2005

JLR Project No. 17732

STORMWATER STORAGE / OVERFLOW BALANCE TABLE

DRAINAGE AREA				INLET FLOW				STORAGE (m^3)			OVERFLOW		SURPLUS
CATCHMENT	AREA #	"C" FACTOR	AREA (Ha)	INLETS (l/s) 20.00	INLETS (l/s) 13.40	Unrest. RYCBs	Equiv. Flow	REQUIRED LOCAL (m^3)	LOCAL + OVERFLOW (m^3)	PROVIDED (m^3)	(m^3)	TO AREA #	STORAGE m^3
ISHPATINA	#15	0.400	0.340	1	0	0	20	29.51	29.51	20.60	8.91	#11	
FINLAYSON	#14	0.400	0.350	1	0	0	20	30.72	30.72	0.00	30.72	#13	
FINLAYSON (at GOWARD)	#13	0.400	0.176	1	0	0	20	11.88	42.61	0.00	42.61	#11	
GOWARD	#11	0.400	0.618	2	0	0	40	51.73	103.26	131.30	-28.04	#6	28.04
FINLAYSON	#10	0.400	0.360	1	0	0	20	31.95	31.95	0.00	31.95	#6	
RY (73, 74, 75, 76, 77, 78)	#9	0.400	0.198	0	0	34	34	10.61	10.61	0.00	10.61	#8	
RY (70, 71, 72, 79, 80)	#8	0.400	0.180	0	0	34	34	8.90	19.51	0.00	19.51	#6	
RY (16-23)	#7	0.400	0.140	0	0	62	62	0.00	0.00	0.00	0.00	#6	
GOWARD (at FINLAYSON/ISHPATINA)	#6	0.400	0.494	2	0	0	40	37.97	89.43	0.00	89.43	#4	
GOWARD	#5	0.400	0.500	1	0	0	20	50.26	50.26	0.00	50.26	#4	
GOWARD	#4	0.400	0.203	1	0	0	20	14.47	154.16	27.08	127.08	#1	
FUTURE TOWNHOUSES	#2	0.500	1.216	5	0	0	100	126.46	126.46	0.00	126.46	#1	
RY(8-15)	#3	0.400	0.202	0	0	34	34	10.99	10.99	0.00	10.99	#1	
BLK 246 and RY of units 62-69	#1	0.228	1.348	2.5	0	0	50	64.19	328.72	1213.00	**-884.28**	-	884.28

OLD CARP ROAD

OLD CARP ROAD

BLOCK 248
PARK

BLOCK 247

BLOCK 246

Bidgood Pond

2ND LINE ROAD

1.9 ha AREA OUTLETS THROUGH BLK 248 VIA SWALE/DITCH SYSTEM TO OLD CARP RD CULVERT

2 YEAR=0.53
I_{10}=59.35mm/hr(1.5 year)
Qp=21.54L/s
-Assumed as Road Row through system
-IPEX Type 'B' ICD will control flow to 30.0L/s

120m³

2 YEAR=0.86
I_{10}=30mm
I=53.63mm/hr (1.5 year)
Qp=46.14L/s
-Assumed as Road Row through system
-IPEX Type 'B' ICD will control flow to 50.0L/s

1200m³

PREWOOD
500m³

ASSUMED FUTURE TOWNHOMES (5 ICDS , 100 L/S)

EXISTING RESIDENTIAL

#1 #1A #2 #3 #4 #5 #6 #7 #8 #9 #10 #11 #12 #13 #14 #15

GOWARD DRIVE

ISHPATINA CRESCENT

FINLAYSON CRESCENT

WHITESIDE TERRACE

PHASE 12D

PHASE 12C

EDGEMOORE CRESCENT

TESKIWA CRESCENT

HALTON TERRACE

2250m²
(750m² ALLOCATED FOR PHASE 12C

LEGEND

- EXISTING CATCH BASIN
- PROPOSED CATCH BASIN
- INTERCONNECTED ROADWAY CB C/W ONE 19.8L/S IPEX TYPE 'A' ICD OR CITY APPROVED EQUIVALENT
- CATCH BASIN WITH INDIVIDUAL 19.8 L/S IPEX TYPE 'A' ICD OR CITY APPROVED EQUIVALENT
- PROPOSED HYDRANT
- EXISTING HYDRANT
- PHASING LIMITS
- EXISTING STORM SEWER & MANHOLE
- PROPOSED STORM SEWER & MANHOLE
- PROPOSED CATCH BASIN & LEAD
- 8 LOT NUMBER
- PROPOSED OVERLAND DRAINAGE
- DRAINAGE AREA LIMITS
- 0.220 / 0.4 EXISTING AREA IN HECTARES / 'R' RUNOFF COEFFICIENT
- 0.350 / 0.4 PROPOSED AREA IN HECTARES / 'R' RUNOFF COEFFICIENT
- 1300m³ PONDING VOLUME

= MAJOR OVERLAND FLOW IS ROUTED TO HYDRO EASEMENT

3	26/08/05	ISSUED WITH 12D SWM REPORT	L.J.
2	11/07/05	REVISED PER CITY COMMENTS	L.J.
1	11/05/05	ISSUED FOR MOE APPROVAL	L.J.

SCALE 0 10m 20m 30m 40m 1:1000

J.L.Richards
ENGINEERS ARCHITECTS PLANNERS
J.L. Richards & Associates Limited
864 Lady Ellen Place
Ottawa, ON Canada
K1Z 5M2
Tel: 613 728 3571
Fax: 613 728 6012

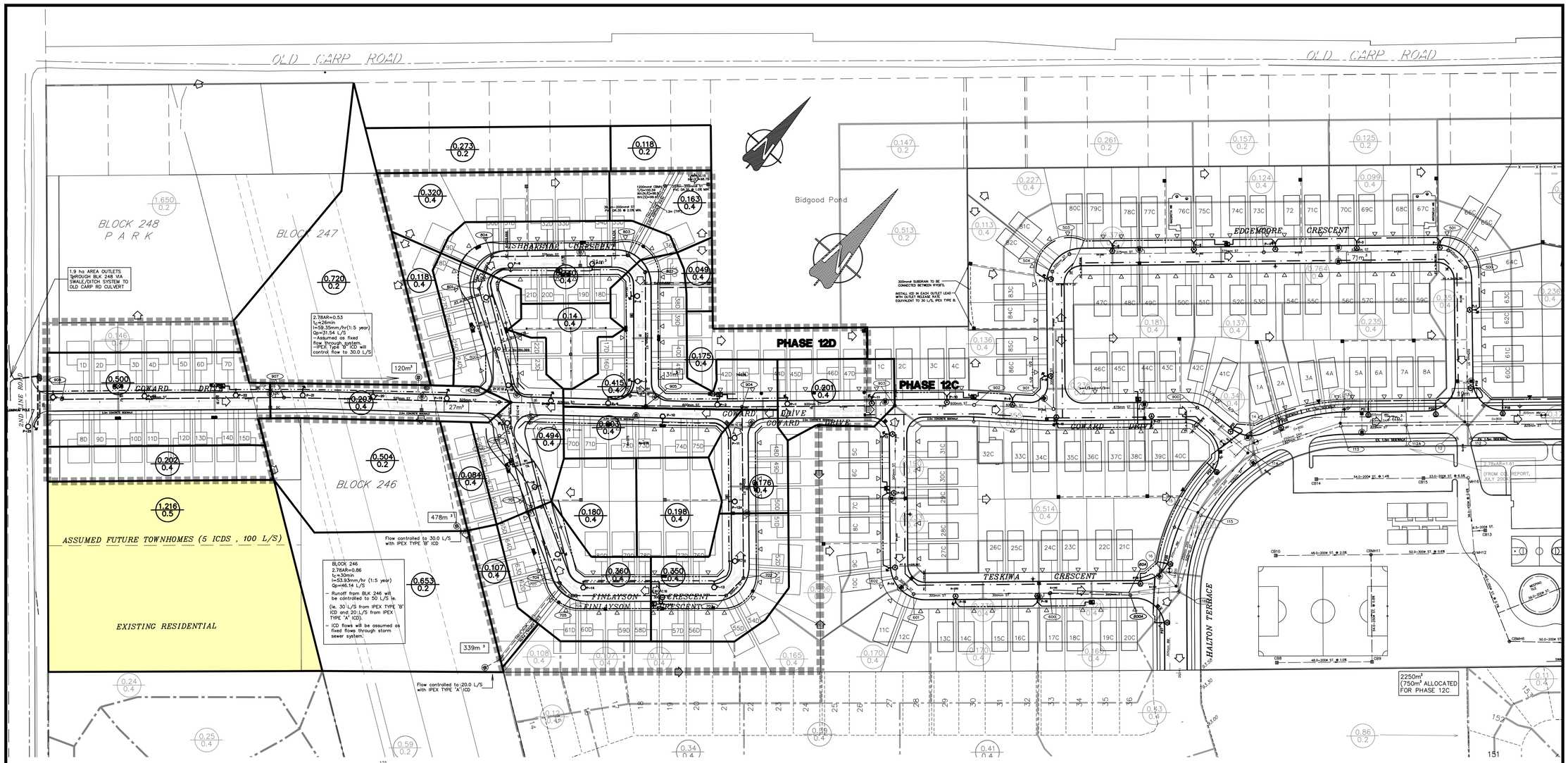
DESIGN J.B.
CHECKED L.J.
DRAWN A.M.
CHECKED
APPROVED

Ottawa

minto

MORGAN'S GRANT
PHASE 12D
STORM DRAINAGE PLAN

JOB No. 17732
DATED APRIL 2005
DWG. No. D-ST 7



LEGEND

- EXISTING CATCH BASIN
- PROPOSED CATCH BASIN
- INTERCONNECTED ROADWAY CB C/W ONE 19.8L/S IPEX TYPE "A" ICD OR CITY APPROVED EQUIVALENT
- CATCH BASIN WITH INDIVIDUAL 19.8 L/S IPEX TYPE "A" ICD OR CITY APPROVED EQUIVALENT
- PROPOSED HYDRANT
- EXISTING HYDRANT
- PHASING LIMITS
- EXISTING STORM SEWER & MANHOLE
- PROPOSED STORM SEWER & MANHOLE
- PROPOSED CATCH BASIN & LEAD
- LOT NUMBER
- PROPOSED OVERLAND DRAINAGE
- DRAINAGE AREA LIMITS
- EXISTING AREA IN HECTARES 'R' RUNOFF COEFFICIENT
- PROPOSED AREA IN HECTARES 'R' RUNOFF COEFFICIENT
- 1300m³ PONDING VOLUME

RECORD DRAWING
PRODUCED FROM INFORMATION PROVIDED BY FIELD INSPECTOR
date: MAY 03, 2013
J.L. RICHARDS & ASSOCIATES LIMITED

W:\17732\D\PHASE 12D\17732 D-ST 7PH12D.dwg

6	03/05/13	RECORD DRAWING	L.J.
4	18/10/05	REVISED PER HYDRO ONE COMMENTS	L.J.
3	26/08/05	ISSUED WITH 12D SWM REPORT	L.J.
2	11/07/05	REVISED PER CITY COMMENTS	L.J.
1	11/05/05	ISSUED FOR MOE APPROVAL	LJ

SCALE
0 10m 20m 30m 40m
1:1000

J.L.Richards
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J.L. Richards & Associates Limited
864 Lady Ellen Place
Ottawa, ON Canada
K1Z 5M2
Tel: 613 728 3571
Fax: 613 728 8012

DESIGN	J.B.
CHECKED	L.J.
DRAWN	A.M.
CHECKED	
APPROVED	

Ottawa

minto

MORGAN'S GRANT
PHASE 12D
STORM DRAINAGE PLAN

JOB. No.	17732
DATED	APRIL 2005
DWG. No.	D-ST 7

OLD CARP ROAD

OLD CARP ROAD

2nd LINE ROAD

BLOCK 248
A R K

BLOCK 247

BLOCK 246

Bidgood Pond

PHASE 12D

PHASE 12C

ASSUMED FUTURE TOWNHOMES

EXISTING RESIDENTIAL

BISHARAH CRESCENT

COWARD DRIVE

FINLAYSON CRESCENT

TESKIWA CRESCENT

EDGEMOORE CRESCENT

HALTON TERRACE

BLOCK 333

LEGEND

- PROPOSED WATERMAIN, VALVE & HYDRANT
- EXISTING WATERMAIN, VALVE & HYDRANT
- EXISTING SANITARY SEWER & MANHOLE
- PROPOSED SANITARY SEWER & MANHOLE
- 45D — LOT NUMBER
- EXISTING DRAINAGE BOUNDARY
- 25 / 0.810 — EXISTING NUMBER OF UNITS / EXISTING AREA IN HECTARES
- PHASE 12D LIMITS
- DRAINAGE BOUNDARY
- 3 / 0.321 — NUMBER OF UNITS / AREA IN HECTARES

RECORD DRAWING
PRODUCED FROM INFORMATION
PROVIDED BY FIELD INSPECTOR
date: MAY. 03, 2013
J.L. RICHARDS & ASSOCIATES LIMITED

3	03/05/13	RECORD DRAWING	L.J.
2	11/07/05	BUILDING FOOTPRINT REVISED	LJ
1	11/05/05	ISSUED FOR MOE APPROVAL	LJ

SCALE
0 10m 20m 30m 40m
HORIZONTAL 1:1000

J.L. Richards
& Associates Limited
864 Lady Ellen Place
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Fax: 613 728 6012
ENGINEERS·ARCHITECTS·PLANNERS

DESIGN J.B.
CHECKED L.J.
DRAWN M.B.
CHECKED
APPROVED

MORGAN'S GRANT
PHASE 12D
SANITARY DRAINAGE PLAN

JOB. No. 17732
DATED AUGUST 2004
DWG. No. D-SAN 7

q (res) = 350 l/cap/day
q (com) = 50,000 l/ha/day
q (inst) = 50,000 l/ha/day
I = 0.280 l/s/ha
Singles = 4.0 pers / unit
Townhouses = 4.0 pers / unit

CITY OF KANATA

MORGAN'S GRANT MASTER SANITARY FLOWS
16087-01

SANITARY SEWER DESIGN SHEET
(Revised: January 31, 2001)
Designed by: G.F.
Checked by: D.G.S.

STREET	M.H. # FROM	M.H. # TO	POPUL. people	AREA ha	CUMMULATIVE POPUL. people	CUMMULATIVE AREA ha	Peaking Factor	POPUL. FLOW l/s	INFIL. FLOW l/s	PEAK FLOW l/s	SEWER DATA DIA. mm	Slope %	CAPAC. l/s	VEL. m/s	LENGTH m	UPSTREAM Ex. Ground	UPSTREAM Pr. Center Line	UPSTREAM Fill	UPSTREAM Obvert	UPSTREAM Invert	UPSTREAM Cover	DOWNSTREAM Ex. Ground	DOWNSTREAM Pr. Center Line	DOWNSTREAM Fill	DOWNSTREAM Obvert	DOWNSTREAM Invert	DOWNSTREAM Cover	COMMENTS
HALTON TERRACE	152	151	20	0.51	20	0.51	4.00	0.32	0.14	0.47	200	3.00	56.80	1.81	68.60	94.900	95.250	0.35	91.339	91.139	3.91	91.800	92.600	0.80	89.281	89.081	3.32	EXISTING SEWER
PIEKOFF CR.	159	157	20	0.43	20	0.43	4.00	0.32	0.12	0.44	200	2.00	46.38	1.48	79.00	98.500	99.800	1.30	95.718	95.518	4.08	97.600	98.500	0.90	94.138	93.938	4.36	PREVIOUSLY SUBMITTED FOR C. OF A.
U/S Areas West & incl. Hydro Easement (Easement (0.5 ha) & Residential (2.10 ha)		157	164	2.60	164	2.60	4.00	2.66	0.73	3.39	200	0.60	25.40	0.81	3.00													FUTURE SEWER
PIEKOFF CR.	157	156	20	0.41	204	3.44	4.00	3.31	0.96	4.27	200	0.60	25.40	0.81	81.10	97.650	98.500	0.85	94.093	93.893	4.41	96.600	97.800	1.20	93.606	93.406	4.19	PREVIOUSLY SUBMITTED FOR C. OF A.
RAYBURN ST.	162	156	40	0.65	40	0.65	4.00	0.65	0.18	0.83	200	0.70	27.44	0.87	98.90	97.700	98.350	0.65	94.392	94.192	3.96	96.600	97.800	1.20	93.700	93.500	4.10	PREVIOUSLY SUBMITTED FOR C. OF A.
PIEKOFF CR.	156	154	28	0.38	272	4.47	4.00	4.41	1.25	5.66	200	2.00	46.38	1.48	59.50	96.600	97.800	1.20	93.606	93.406	4.19	95.300	93.600	-1.70	92.416	92.216	1.18	PREVIOUSLY SUBMITTED FOR C. OF A.
	154	153	32	0.54	304	5.01	4.00	4.93	1.40	6.33	200	3.00	56.80	1.81	56.20	95.300	93.600	-1.70	92.298	92.098	1.30	94.500	94.700	0.20	90.612	90.412	4.09	PREVIOUSLY SUBMITTED FOR C. OF A.
	153	151	8	0.23	312	5.24	4.00	5.06	1.47	6.52	200	3.00	56.80	1.81	49.20	94.500	94.700	0.20	90.576	90.376	4.12	93.100	93.100	0.00	89.100	88.900	4.00	PREVIOUSLY SUBMITTED FOR C. OF A.
HALTON TERRACE	151	150	0	0.00	332	5.75	4.00	5.38	1.61	6.99	200	0.60	25.40	0.81	41.4	91.800	92.600	0.80	88.481	88.281	4.12	90.800	92.000	1.20	88.233	88.033	3.77	EXISTING SEWER
	150	149	120	0.86	452	6.61	4.00	7.32	1.85	9.17	200	0.60	25.40	0.81	112.80	90.800	92.000	1.20	88.233	88.033	3.77	90.650	91.730	1.08	87.556	87.356	4.17	EXISTING SEWER
	149	148	28	0.24	480	6.85	3.98	7.75	1.92	9.66	200	0.60	25.40	0.81	40.6	90.650	91.730	1.08	87.556	87.356	4.17	91.000	91.800	0.80	87.312	87.112	4.49	EXISTING SEWER
UPSTREAM OF MH 714 (West)		214	124	2.92	124	2.92	4.00	2.01	0.82	2.83	200	0.70	27.44	0.87	95.00													FUTURE SEWER PHASE 8
HASLEMERE ST.	214	215	12	0.24	136	3.16	4.00	2.20	0.88	3.09	200	0.70	27.44	0.87	66.50													FUTURE SEWER PHASE 8
	215	216	16	1.67	152	4.83	4.00	2.46	1.35	3.82	200	0.72	27.83	0.89	90.00													FUTURE SEWER PHASE 8
SCAMPTON ST.	216	218	36	0.46	188	5.29	4.00	3.05	1.48	4.53	200	0.80	29.33	0.93	70.00													FUTURE SEWER PHASE 8
PORTADOWN CR.	220	219	32	0.46	32	0.46	4.00	0.52	0.13	0.65	200	1.62	41.74	1.33	66.00													FUTURE SEWER PHASE 8
	219	218	0	0.11	32	0.57	4.00	0.52	0.16	0.68	200	0.25	16.40	0.52	42.00													FUTURE SEWER PHASE 8
SCAMPTON ST.	218	225	40	0.52	260	6.38	4.00	4.21	1.79	6.00	200	1.50	40.17	1.28	80.50													FUTURE SEWER PHASE 8
PORTADOWN CR.	221	222	20	0.38	20	0.38	4.00	0.32	0.11	0.43	200	2.60	52.88	1.68	67.00													FUTURE SEWER PHASE 8
	222	223	4	0.10	24	0.48	4.00	0.39	0.13	0.52	200	1.20	35.93	1.14	8.50													FUTURE SEWER PHASE 8
	223	224	32	0.44	56	0.92	4.00	0.91	0.26	1.17	200	1.20	35.93	1.14	58.00													FUTURE SEWER PHASE 8
	224	225	8	0.26	64	1.18	4.00	1.04	0.33	1.37	200	0.52	23.65	0.75	56.00													FUTURE SEWER PHASE 8
SCAMPTON ST.	225	227	36	0.49	360	8.05	4.00	5.83	2.25	8.09	200	1.87	44.85	1.43	70.50													FUTURE SEWER PHASE 8
	227	200	28	0.44	388	8.49	4.00	6.29	2.38	8.66	200	1.00	32.80	1.04	74.00													FUTURE SEWER PHASE 8
WHERNSIDE ST.	213	212	24	0.62	24	0.62	4.00	0.39	0.17	0.56	200	0.35	19.40	0.62	52.00													FUTURE SEWER PHASE 8
	212	211	52	0.71	76	1.33	4.00	1.23	0.37	1.60	200	1.44	39.35	1.25	97.00													FUTURE SEWER PHASE 8
	211	206	60	0.78	136	2.11	4.00	2.20	0.59	2.79	200	2.70	53.89	1.72	97.00													FUTURE SEWER PHASE 8
	206	205	16	0.32	152	2.43	4.00	2.46	0.68	3.14	200	3.49	61.27	1.95	53.50													FUTURE SEWER PHASE 8
	205	203	0	0.11	152	2.54	4.00	2.46	0.71	3.17	200	3.26	59.21	1.88	24.50													FUTURE SEWER PHASE 8
HALTON TERRACE	203	202	16	0.35	168	2.89	4.00	2.72	0.81	3.53	200	0.48	22.72	0.72	76.50													FUTURE SEWER PHASE 8
	202	201	8	0.19	176	3.08	4.00	2.85	0.86	3.71	200	0.68	27.04	0.86	47.50													FUTURE SEWER PHASE 8
BEAULY ST.	207	208	8	0.13	8	0.13	4.00	0.13	0.04	0.17	200	0.35	19.40	0.62	25.00													FUTURE SEWER PHASE 8
	208	209	28	0.51	36	0.64	4.00	0.58	0.18	0.76	200	0.76	28.59	0.91	70.50													FUTURE SEWER PHASE 8
	209	210	8	0.17	44	0.81	4.00	0.71	0.23	0.94	200	0.76	28.59	0.91	10.00													FUTURE SEWER PHASE 8
	210	201	16	0.34	60	1.15	4.00	0.97	0.32	1.29	200	1.30	37.39	1.19	75.00													FUTURE SEWER PHASE 8
HALTON TERRACE	201	200	16	0.32	252	4.55	4.00	4.08	1.27	5.36	200	0.92	31.46	1.00	79.50													FUTURE SEWER PHASE 8
HALTON TERRACE	200	148	0	0.21	640	13.25	3.92	10.15	3.71	13.86	200	1.10	34.40	1.09	80.00													FUTURE SEWER PHASE 8
Upstream Areas West of Hydro Easement		167	456	13.01	456	13.01	3.99	7.38	3.64	11.02	250	2.00	84.09	1.71	100.00													FUTURE SEWER
KLONDIKE RD.	167	166	92	0.84	548	13.85	3.95	8.78	3.88	12.65	250	2.20	88.20	1.80	100.00	101.700	101.900	0.20	97.580	97.330	4.32	99.200	99.600	0.40	95.380	95.130	4.22	PREVIOUSLY SUBMITTED FOR C. OF A.
	166	165	88	0.80	636	14.65	3.92	10.09	4.10	14.20	250	4.00	118.92	2.42	97.50	99.200	99.600	0.40	94.780	94.530	4.82	94.400	95.000	0.60	90.880	90.630	4.12	PREVIOUSLY SUBMITTED FOR C. OF A.
PIEKOFF CR.	160	161	48	0.69	48	0.69	4.00	0.78	0.19	0.97	200	2.20	48.62	1.55	102.10	91.450	100.260	8.81	96.844	96.644	3.42	97.700	98.500	0.80	94.600	94.400	3.90	PREVIOUSLY SUBMITTED FOR C. OF A.
	161	163	20	0.34	68	1.03	4.00	1.10	0.29	1.39	200	4.50	69.57	2.21	79.10	97.700	98.500	0.80	94.600	94.400	3.90	93.100	94.800	1.70	91.041	90.841	3.76	PREVIOUSLY SUBMITTED FOR C. OF A.
WALLSEND AVE.	155	163	80	0.54	80	0.54	4.00	1.30	0.15	1.45	200	0.60	25.40	0.81	70.70	94.600	95.350	0.75	91.504	91.304	3.85	93.100	94.900	1.80	91.080	90.880	3.82	PREVIOUSLY SUBMITTED FOR C. OF A.
WALLSEND AVE.	163	164	16	0.15	164	1.72	4.00	2.66	0.48	3.14	200	0.60	25.40	0.81	34.00	93.100	94.900	1.80	90.984	90.784	3.92	93.400	94.600	1.20	90.780	90.580	3.82	PREVIOUSLY SUBMITTED FOR C. OF A.
	164	165	16	0.18	180	1.90	4.00	2.92	0.53	3.45	200	0.60	25.40	0.81	46.70	93.400	94.600	1.20	90.780	90.580	3.82	94.400	95.000	0.60	90.500	90.300	4.50	PREVIOUSLY SUBMITTED FOR C. OF A.
KLONDIKE RD.	165	165A	40	0.35	856	16.90	3.84	13.32	4.73	18.06	250	4.30	123.30	2.51	59.30	94.400	95.000	0.60	90.280	90.030	4.72	91.800	91.800	0.00	87.730	87.480	4.07	PREVIOUSLY SUBMITTED FOR C. OF A.
	165A	148	0	0.00	856	16.90	3.84	13.32	4.73	18.06	250	0.40	37.61	0.77	21.00	91.800	91.800	0.00	87.134	86.884	4.67	91.700	91.800	0.10	87.050	86.800	4.75	PREVIOUSLY SUBMITTED FOR C. OF A.
KLONDIKE RD.	148	147	43	0.28	2019	37.28	3.58	29.30	10.44	39.74	300	0.40	61.15	0.87	85.3	91.700	91.800	0.10	87.016	86.716	4.78	91.400	91.600	0.20	86.675	86.375	4.93	EXISTING SEWER

STREET	M.H. #		POPUL.	AREA	CUMMULATIVE		Peaking	POPUL.	INFIL.	PEAK	SEWER DATA					UPSTREAM						DOWNSTREAM						COMMENTS
	FROM	TO	people	ha	POPUL. people	AREA ha	Factor	FLOW l/s	FLOW l/s	FLOW l/s	DIA. mm	Slope %	CAPAC. l/s	VEL. m/s	LENGTH m	Ex. Ground	Pr. Center Line	Fill	Obvert	Invert	Cover	Ex. Ground	Pr. Center Line	Fill	Obvert	Invert	Cover	
WIMBLEDON ST.	48A	48	12	0.13	12	0.13	4.00	0.19	0.04	0.23	200	1.00	32.80	1.04	15.0	90.600	91.673	1.07	88.213	88.013	3.46	90.550	91.566	1.02	88.063	87.863	3.50	EXISTING SEWER
	48	47	28	0.38	40	0.51	4.00	0.65	0.14	0.79	200	0.60	25.40	0.81	53.3	90.550	91.566	1.02	88.033	87.833	3.53	90.200	91.400	1.20	87.713	87.513	3.69	EXISTING SEWER
	47	46	12	0.04	52	0.55	4.00	0.84	0.15	1.00	200	0.60	25.40	0.81	9.1	90.200	91.400	1.20	87.683	87.483	3.72	90.200	91.430	1.23	87.628	87.428	3.80	EXISTING SEWER
	46	45	80	0.61	132	1.16	4.00	2.14	0.32	2.46	200	0.60	25.40	0.81	71.9	90.200	91.430	1.23	87.598	87.398	3.83	90.350	91.470	1.12	87.167	86.967	4.30	EXISTING SEWER
	45	147	16	0.17	148	1.33	4.00	2.40	0.37	2.77	200	0.60	25.40	0.81	41.0	90.350	91.470	1.12	87.167	86.967	4.30	91.000	91.600	0.60	86.921	86.721	4.68	EXISTING SEWER
KLONDIKE RD.	147	146	24	0.54	2191	39.15	3.55	31.55	10.96	42.51	300	0.40	61.15	0.87	98.5	91.000	91.600	0.60	86.675	86.375	4.92	91.250	91.650	0.40	86.281	85.981	5.37	EXISTING SEWER
	146	145	44	0.52	2235	39.67	3.55	32.12	11.11	43.23	300	0.60	74.90	1.06	96.8	91.250	91.650	0.40	86.281	85.981	5.37	89.900	90.400	0.50	85.700	85.400	4.70	EXISTING SEWER
PENRITH ST.	207	206	12	0.17	12	0.17	4.00	0.19	0.05	0.24	200	1.00	32.80	1.04	31.0	89.560	90.500	0.94	87.555	87.355	2.95	89.350	90.700	1.35	87.245	87.045	3.45	FUTURE SEWER PHASE 7
BRECHIN ST.	205	206	60	0.73	60	0.73	4.00	0.97	0.20	1.18	200	2.30	49.74	1.58	105.8	91.600	93.040	1.44	90.440	90.240	2.60	89.350	90.700	1.35	88.007	87.807	2.69	FUTURE SEWER PHASE 7
PENRITH ST.	206	201	20	0.35	92	1.25	4.00	1.49	0.35	1.84	200	0.60	25.40	0.81	69.50	89.350	90.700	1.35	87.245	87.045	3.46	89.910	91.900	1.99	86.828	86.628	5.07	FUTURE SEWER PHASE 7
BRECHIN ST.	204	203	24	0.40	24	0.40	4.00	0.39	0.11	0.50	200	1.00	32.80	1.04	61.4	91.790	93.070	1.28	90.470	90.270	2.60	92.000	93.100	1.10	89.856	89.656	3.24	FUTURE SEWER PHASE 7
WOLISTON ST.	203	202	32	0.38	56	0.78	4.00	0.91	0.22	1.13	200	1.07	33.92	1.08	64.0	92.000	93.100	1.10	89.816	89.616	3.28	91.160	92.460	1.30	89.131	88.931	3.33	FUTURE SEWER PHASE 7
	202	201	24	0.28	80	1.06	4.00	1.30	0.30	1.59	200	1.03	33.28	1.06	50.0	91.160	92.460	1.30	89.091	88.891	3.37	89.910	91.900	1.99	88.576	88.376	3.32	FUTURE SEWER PHASE 7
PENRITH ST.	201	192	16	0.38	188	2.69	4.00	3.05	0.75	3.80	200	0.60	25.40	0.81	71.50	89.910	91.900	1.99	86.828	86.628	5.07	90.700	92.200	1.50	86.399	86.199	5.80	FUTURE SEWER PHASE 7
BRECHIN ST.	196	198	12	0.20	12	0.20	4.00	0.19	0.06	0.25	200	0.40	20.74	0.66	29.8	91.790	92.820	1.03	90.220	90.020	2.60	91.750	93.100	1.35	90.101	89.901	3.00	FUTURE SEWER PHASE 7
BRECHIN ST	200	198	20	0.31	20	0.31	4.00	0.32	0.09	0.41	200	0.90	31.11	0.99	65.1	92.000	93.100	1.10	90.500	90.300	2.60	91.750	93.100	1.35	89.914	89.714	3.19	FUTURE SEWER PHASE 7
ORMSBY ST.	198	197	28	0.33	60	0.84	4.00	0.97	0.24	1.21	200	1.40	38.80	1.24	64.00	91.750	93.100	1.35	89.974	89.674	3.23	91.240	92.500	1.26	88.978	88.778	3.52	FUTURE SEWER PHASE 7
	197	192	24	0.28	84	1.12	4.00	1.36	0.31	1.67	200	1.00	32.80	1.04	49.9	91.240	92.500	1.26	88.938	88.738	3.56	90.700	92.200	1.50	88.439	88.239	3.76	FUTURE SEWER PHASE 7
PENRITH ST.	192	193	8	0.15	280	3.96	4.00	4.54	1.11	5.65	200	0.60	25.40	0.81	34.90	90.700	92.200	1.50	86.369	86.169	5.83	91.000	91.700	0.70	86.160	85.960	5.54	FUTURE SEWER PHASE 7
	193	194	8	0.15	288	4.11	4.00	4.67	1.15	5.82	200	0.60	25.40	0.81	35.1	91.000	91.700	0.70	86.129	85.929	5.57	91.000	92.200	1.20	85.918	85.718	6.28	FUTURE SEWER PHASE 7
BRECHIN ST.	196	195	16	0.47	16	0.47	4.00	0.26	0.13	0.39	200	0.80	29.33	0.93	42.1	91.810	92.930	1.12	90.330	90.130	2.60	89.900	91.400	1.50	89.993	89.793	1.41	FUTURE SEWER PHASE 7
	195	194	44	0.63	60	1.10	4.00	0.97	0.31	1.28	200	0.90	31.11	0.99	85.2	89.900	91.400	1.50	89.953	89.753	1.45	91.000	92.200	1.20	89.186	88.986	3.01	FUTURE SEWER PHASE 7
PENRITH ST.	194	145	20	0.30	368	5.51	4.00	5.96	1.54	7.51	250	0.40	37.56	0.77	73.30	91.000	92.200	1.20	85.942	85.692	6.26	89.900	90.400	0.50	85.650	85.400	4.75	FUTURE SEWER PHASE 7
LAXFORD DR.	145	27	44	0.59	2647	45.77	3.49	37.40	12.82	50.22	300	0.40	61.15	0.87	103.60	89.900	90.400	0.50	85.672	85.372	4.73	89.950	91.000	1.05	85.258	84.958	5.74	EXISTING SEWER
STREET NO. 4	41	40	56	0.97	56	0.97	4.00	0.91	0.27	1.18	200	1.00	32.80	1.04	50.00	90.200	91.420	1.22	87.800	87.600	3.62	90.000	91.160	1.16	87.300	87.100	3.86	EXISTING SEWER
	40	27	16	0.29	72	1.26	4.00	1.17	0.35	1.52	200	1.00	32.80	1.04	72.00	90.000	91.160	1.16	86.626	86.426	4.53	89.950	91.000	1.05	85.906	85.706	5.09	EXISTING SEWER
LAXFORD DR.	27	Stub	16	1.88	2735	48.91	3.48	38.51	13.69	52.21	300	0.44	64.49	0.91	34.80	89.950	91.000	1.05	85.258	84.958	5.74	89.700	91.050	1.35	85.103	84.803	5.95	EXISTING SEWER
	Stub	26	0	0.00	2735	48.91	3.48	38.51	13.69	52.21	300	0.44	64.49	0.91	29.90	89.950	91.000	1.05	85.103	84.803	5.90	89.550	90.520	0.97	84.970	84.670	5.55	EXISTING SEWER
	26	25	0	0.05	2735	48.96	3.48	38.51	13.71	52.22	300	0.43	63.65	0.90	12.00	89.550	90.520	0.97	84.905	84.605	5.61	89.500	90.450	0.95	84.853	84.553	5.60	EXISTING SEWER
	25	24	8	1.99	2743	50.95	3.48	38.61	14.27	52.88	300	0.41	61.83	0.87	20.30	89.500	90.450	0.95	84.805	84.505	5.64	89.400	90.200	0.80	84.722	84.422	5.48	EXISTING SEWER
REDCAR CR.	33	34	40	0.58	40	0.58	4.00	0.65	0.16	0.81	200	0.60	25.40	0.81	79.3	89.400	90.400	1.00	86.846	86.646	3.55	89.500	90.350	0.85	86.370	86.170	3.98	EXISTING SEWER
	34	24	0	0.08	40	0.66	4.00	0.65	0.18	0.83	200	0.60	25.40	0.81	25.0	89.500	90.350	0.85	85.570	85.370	4.78	89.400	90.200	0.80	85.420	85.220	4.78	EXISTING SEWER
LAXFORD DR.	24	22	36	0.60	2819	52.21	3.47	39.57	14.62	54.19	300	0.40	61.15	0.87	95.1	89.400	90.200	0.80	84.720	84.420	5.48	88.500	89.700	1.20	84.340	84.040	5.36	EXISTING SEWER
STREET No. 1 (PHASE 5B)	13	14	4	0.05	4	0.05	4.00	0.06	0.01	0.08	200	0.60	25.40	0.81	11.5	90.000	91.260	1.26	88.021	87.821	3.24	89.900	91.400	1.50	87.952	87.752	3.45	FUTURE PHASE 5B
	14	15	24	0.42	28	0.47	4.00	0.45	0.13	0.59	200	0.60	25.40	0.81	40.0	89.900	91.400	1.50	87.922	87.722	3.48	89.900	90.970	1.07	87.682	87.482	3.29	FUTURE PHASE 5B
	15	16	20	0.42	48	0.89	4.00	0.78	0.25	1.03	200	0.72	27.83	0.89	58.0	89.900	90.970	1.07	87.625	87.425	3.35	89.500	91.000	1.50	87.207	87.007	3.79	FUTURE PHASE 5B
LARK LANE	16	22	0	0.00	48	0.89	4.00	0.78	0.25	1.03	200	4.25	67.61	2.15	79.0	89.500	91.000	1.50	87.567	87.367	3.43	88.600	89.700	1.10	84.210	84.010	5.49	FUTURE PHASE 5B
LAXFORD DR.	22	21	12	0.31	2879	53.41	3.46	40.32	14.95	55.28	300	0.40	61.15	0.87	50.1	88.500	89.700	1.20	84.300	84.000	5.40	88.600	89.700	1.10	84.100	83.800	5.60	EXISTING SEWER
REDCAR CR.	33	32	60	0.66	60	0.66	4.00	0.97	0.18	1.16	200	1.46	39.64	1.26	97.5	89.400	90.400	1.00	86.624	86.424	3.78	87.350	89.350	2.00	85.200	85.000	4.15	EXISTING SEWER
	32	31	8	0.06	68	0.72	4.00	1.10	0.20	1.30	200	1.46	39.63	1.26	10.9	87.350	89.350	2.00	84.819	84.619	4.53	87.000	89.300	2.30	84.660	84.460	4.64	EXISTING SEWER
	31	30	28	0.55	96	1.27	4.00	1.56	0.36	1.91	200	0.58	24.98	0.80	73.4	87.000	89.300	2.30	84.626	84.426	4.67	88.250	88.900	0.65	84.200	84.000	4.70	EXISTING SEWER
	30	21	4	0.13	100	1.40	4.00	1.62	0.39	2.01	200	0.68	27.08	0.86	28.7	88.250	88.900	0.65	84.196	83.996	4.70	88.680	89.700	1.02	84.000	83.800	5.70	EXISTING SEWER
LAXFORD DR.	21	20	44	0.57	3023	55.38	3.44	42.12	15.51	57.63	300	0.81	87.02	1.23	87.2	88.600	89.300	0.70	83.916	83.616	5.38	87.400	86.750	-0.65	83.210	82.910	3.54	EXISTING SEWER
	20	138	0	0.00	3023	55.38	3.44	42.12	15.51	57.63	300	0.60	74.90	1.06	21.3	87.400	88.900	1.50	83.178	82.878	5.72	87.170	86.180	-0.99	83.050	82.750	3.13	EXISTING SEWER
KLONDIKE RD NORTH	144A	144	32	0.45	32	0.45	4.00	0.52	0.13	0.64	200	0.57	24.69	0.79	73.4	90.300	90.500	0.20	86.640	86.440	3.86	90.000	90.200	0.20	86.224	86.024	3.98	PHASE 5B
	144	143	68	0.77	100	1.22	4.00	1.62	0.34	1.96	200	1.22	36.16	1.15	100.0	90.000	90.200	0.20	86.224	86.024	3.98	88.200	88.400	0.20	85.008	84.808	3.39	PHASE 5B
GOULBOURN RD (PHASE 5B)	143	142A	40	0.42	140	1.64	4.00	2.27	0.46	2.73	200	1.83	44.33	1.41	82.0	88.200	88.400	0.20	85.008	84.808	3.39	87.000	87.300	0.30	83.510	83.310	3.79	PHASE 5B
	142A	142	24	0.37	164	2.01	4.00	2.66	0.56	3.22	200	1.75	43.42	1.38	69.0	87.000	87.300	0.30	83.510	83.310	3.79	85.500	85.700	0.20	82.300	82.100	3.40	PHASE 5B
HEYSHAM CR.	177	176	52	0.82	52	0.82	4.00	0.84	0.23	1.07	200	1.10	34.40	1.09	93.9	90.200	91.400	1.20	88.050	87.850	3.35	89.000	90.100	1.10	87.017	86.817	3.08	FUTURE SEWER PHASE 6
	176	175	4	0.11	56	0.93	4.00	0.91	0.26	1.17	200	1.10	34.40	1.09	11.0	89.000	90.100	1.10	86.967	86.767	3.13	89.000	90.150	1.15	86.846	86.646	3.30	FUTURE SEWER PHASE 6
	175	174	48	0.69	104	1.62	4.00	1.69	0.45	2.14	200	1.10	34.40	1.09	89.80	89.000	90.150	1.15	86.796	86.596	3.35	88.050	89.190	1.14	85.808	85.608	3.38	FUTURE SEWER PHASE 6
	174	173	36	0.49	140	2.11	4.00	2.27	0.59	2.86	200	1.10	34.40	1.09	69.70	88.050	89.190	1.14	85.808	85.608	3.38	87.200	88.400	1.20	85.041	84.841	3.36	FUTURE SEWER PHASE 6
PALTON ST.	189	173	24	0.28	24	0.28	4.00	0.39	0.08	0.47	200	1.05	33.61	1.07	78.50													FUTURE SEWER PHASE 6
HEYSHAM CR.	173	172	48	0.43	212	2.82	4.00	3.44	0.79	4.22	200	1.50	40.18	1.28	80.30	87.200	88.400	1.20	85.041	84.841	3.36	86.000	87.200	1.20	83.836	83.636	3.36	FUTURE SEWER PHASE 6
FLAMBOROUGH WAY	172	171	40	0.48	252	3.30	4.00	4.08	0.92	5.01	250	0.40	37.61	0.77	81.90	86.000	87.200	1.20	83.274	83.024	3.93	85.840	87.130	1.29	82.946	82.696	4.18	FUTURE SEWER PHASE 6
	171	170	32	0.41	284	3.71	4.00	4.60	1.04	5.64	250	0.40	37.61	0.77	90.00	85.840	87.130	1.29	82.946	82.696	4.18	85.430	87.200	1.77	82.586	82.336	4.61	FUTURE SEWER PHASE 6

STREET	M.H. #		POPUL.	AREA	CUMMULATIVE POPUL.	CUMMULATIVE AREA	Peaking Factor	POPUL. FLOW	INFIL. FLOW	PEAK FLOW	SEWER DATA DIA.	Slope	CAPAC.	VEL.	LENGTH	UPSTREAM Ex. Ground	Pr. Center Line	Fill	Obvert	Invert	Cover	DOWNSTREAM Ex. Ground	Pr. Center Line	Fill	Obvert	Invert	Cover	COMMENTS
	FROM	TO	people	ha	people	ha		l/s	l/s	l/s	mm	%	l/s	m/s	m													
HEYSHAM CR.	177	179	12	0.19	12	0.19	4.00	0.19	0.05	0.25	200	0.80	25.42	0.81	32.90	90.200	91.400	1.20	88.050	87.850	3.35	90.500	91.160	0.66	87.852	87.652	3.31	FUTURE SEWER PHASE 6
	179	180	20	0.30	32	0.49	4.00	0.52	0.14	0.66	200	0.60	25.40	0.81	38.00	90.500	91.160	0.66	87.822	87.622	3.34	90.890	91.770	0.88	87.594	87.394	4.18	FUTURE SEWER PHASE 6
	180	181	4	0.08	36	0.57	4.00	0.58	0.16	0.74	200	0.60	25.36	0.81	16.30	90.890	91.770	0.88	87.564	87.364	4.21	91.000	91.980	0.98	87.467	87.267	4.51	FUTURE SEWER PHASE 6
	181	182	8	0.26	44	0.83	4.00	0.71	0.23	0.95	200	0.60	25.40	0.81	10.40	91.000	91.980	0.98	87.417	87.217	4.56	90.970	91.840	0.87	87.355	87.155	4.49	FUTURE SEWER PHASE 6
	182	183	48	0.72	92	1.55	4.00	1.49	0.43	1.92	200	1.40	38.80	1.24	86.10	90.970	91.840	0.87	87.305	87.105	4.53	89.590	89.740	0.15	86.100	85.900	3.64	FUTURE SEWER PHASE 6
COLNE COURT	187	187A	24	0.46	24	0.46	4.00	0.39	0.13	0.52	200	0.60	25.40	0.81	44.30													FUTURE SEWER PHASE 6
	187A	183	0	0.00	24	0.46	4.00	0.39	0.13	0.52	200	0.60	25.40	0.81	34.00													FUTURE SEWER PHASE 6
HEYSHAM CR.	183	184	40	0.58	156	2.59	4.00	2.53	0.73	3.25	200	1.80	44.00	1.40	76.70	89.590	89.740	0.15	85.951	85.751	3.79	87.300	88.600	1.30	84.570	84.370	4.03	FUTURE SEWER PHASE 6
COLNE COURT	187	188	8	0.18	8	0.18	4.00	0.13	0.05	0.18	200	1.40	38.82	1.24	32.60				86.800	86.600					86.343	86.143		FUTURE SEWER PHASE 6
	188	188A	8	0.20	16	0.38	4.00	0.26	0.11	0.37	200	1.42	39.08	1.24	11.00				86.293	86.093					86.137	85.937		FUTURE SEWER PHASE 6
	188A	189	40	0.52	56	0.90	4.00	0.91	0.25	1.16	200	1.02	33.12	1.05	81.50				86.091	85.891					85.260	85.060		FUTURE SEWER PHASE 6
PALTON ST.	189	185	36	0.33	92	1.23	4.00	1.49	0.34	1.84	200	0.60	25.40	0.81	55.00				85.200	85.000					84.870	84.670		FUTURE SEWER PHASE 6
	185	184	24	0.36	116	1.59	4.00	1.88	0.45	2.32	200	0.60	25.40	0.81	61.80				84.870	84.670					84.499	84.299		FUTURE SEWER PHASE 6
HEYSHAM CR.	184	170	44	0.57	316	4.75	4.00	5.12	1.33	6.45	200	1.80	44.00	1.40	80.30	87.300	88.600	1.30	84.445	84.245	4.15	85.430	87.130	1.70	83.000	82.800	4.13	FUTURE SEWER PHASE 6
FLAMBOROUGH WAY	170	142	0	0.15	600	8.61	3.93	9.56	2.41	11.97	250	0.40	37.61	0.77	82.90	85.430	87.130	1.70	82.586	82.336	4.54	85.500	85.700	0.20	82.254	82.004	3.45	FUTURE SEWER PHASE 6
GOULBOURN RD (PHASE 5B)	142	141	12	0.22	776	10.84	3.87	12.16	3.04	15.20	250	0.35	35.18	0.72	64.0	85.500	85.700	0.20	82.254	82.004	3.45	86.000	85.500	-0.50	82.030	81.780	3.47	PHASE 5B
	141	140	4	0.14	780	10.98	3.87	12.22	3.07	15.29	250	0.35	35.18	0.72	28.5	86.000	85.500	-0.50	82.000	81.750	3.50	86.000	85.800	-0.20	81.900	81.650	3.90	PHASE 5B
STREET No. 1 (PHASE 5B)	13	12	36	0.57	36	0.57	4.00	0.58	0.16	0.74	200	2.00	46.38	1.48	70.0	90.000	91.260	1.26	88.000	87.800	3.26	89.000	90.250	1.25	86.600	86.400	3.65	PHASE 5B
	12	11	36	0.51	72	1.08	4.00	1.17	0.30	1.47	200	2.00	46.38	1.48	70.0	89.000	90.250	1.25	86.600	86.400	3.65	88.000	89.400	1.40	85.200	85.000	4.20	PHASE 5B
STREET No. 1 (PHASE 5B)	16	17	44	0.70	44	0.70	4.00	0.71	0.20	0.91	200	2.00	46.38	1.48	79.0	89.500	91.000	1.50	86.580	86.380	4.42	88.100	89.500	1.40	86.000	85.800	3.50	PHASE 5B
	17	18	4	0.10	48	0.80	4.00	0.78	0.22	1.00	200	1.00	32.80	1.04	12.5	88.100	89.500	1.40	85.955	85.755	3.55	88.000	89.500	1.50	85.830	85.630	3.67	PHASE 5B
	18	19	12	0.20	60	1.00	4.00	0.97	0.28	1.25	200	1.00	32.80	1.04	35.0	88.000	89.500	1.50	85.800	85.600	3.70	88.000	89.500	1.50	85.450	85.250	4.05	PHASE 5B
	19	11	0	0.15	60	1.15	4.00	0.97	0.32	1.29	200	0.60	25.40	0.81	38.0	88.000	89.200	1.20	85.428	85.228	3.77	88.000	89.400	1.40	85.200	85.000	4.20	PHASE 5B
STREET No. 1 (PHASE 5B)	11	10	28	0.35	160	2.58	4.00	2.59	0.72	3.31	200	3.80	63.93	2.03	56.0	88.000	89.400	1.40	85.128	84.928	4.27	86.600	87.000	0.40	83.000	82.800	4.00	PHASE 5B
	10	140	0	0.00	160	2.58	4.00	2.59	0.72	3.31	200	2.00	46.38	1.48	34.0	86.600	87.000	0.40	82.555	82.355	4.45	86.000	85.800	-0.20	81.875	81.675	3.93	PHASE 5B
GOULBOURN RD (PHASE 5B)	140	139	24	0.46	964	14.02	3.81	14.88	3.93	18.80	250	0.35	35.18	0.72	81.0	86.000	85.800	-0.20	81.900	81.650	3.90	86.100	86.300	0.20	81.616	81.366	4.68	PHASE 5B
	139	138	48	0.59	1012	14.61	3.80	15.56	4.09	19.66	250	0.35	35.18	0.72	67.5	86.100	86.300	0.20	81.616	81.366	4.68	86.400	86.100	-0.30	81.380	81.130	4.72	PHASE 5B
GOULBOURN RD	138	137	4	0.35	4039	70.34	3.33	54.48	19.70	74.17	375	0.40	110.88	1.00	70.4	86.000	86.180	0.18	81.359	80.984	4.82	86.250	86.200	-0.05	81.077	80.702	5.12	EXISTING SEWER
GOULBOURN RD	135	136	48	0.66	48	0.66	4.00	0.78	0.18	0.96	200	1.39	38.60	1.23	72.2	88.200	88.300	0.10	84.200	84.000	4.10	86.200	86.450	0.25	83.200	83.000	3.25	EXISTING SEWER
	136	137	20	0.39	68	1.05	4.00	1.10	0.29	1.40	200	0.71	27.63	0.88	70.4	86.200	86.450	0.25	83.200	83.000	3.25	86.100	86.200	0.10	82.700	82.500	3.50	EXISTING SEWER
OAKHAM RIDGE	137	135			4107	71.39	3.32	55.29	19.99	75.28	375	0.40	110.88	1.00	48.0	86.200	86.200	0.00	81.018	80.643	5.18	85.000	85.000	0.00	80.826	80.451	4.17	EXISTING SEWER
	135	134	24	0.40	4131	71.79	3.32	55.57	20.10	75.67	375	0.40	110.88	1.00	61.1	84.200	85.050	0.85	80.826	80.451	4.2	81.900	83.110	1.21	80.582	80.207	2.5	EXISTING SEWER
	134	133	4	0.11	4135	71.90	3.32	55.62	20.13	75.75	375	0.40	110.88	1.00	5.6	81.900	83.110	1.21	80.541	80.166	2.6	81.850	83.000	1.15	80.519	80.144	2.5	EXISTING SEWER
	133	132	28	0.25	4163	72.15	3.32	55.95	20.20	76.15	375	0.40	110.88	1.00	42.9	81.850	83.000	1.15	80.480	80.105	2.5	81.500	82.450	0.95	80.308	79.933	2.1	EXISTING SEWER
	132	130	12	0.23	4175	72.38	3.32	56.09	20.27	76.36	375	0.40	110.88	1.00	45.6	81.500	82.450	0.95	80.307	79.932	2.1	81.800	82.850	1.05	80.125	79.750	2.7	EXISTING SEWER
	131	130	52	0.73	52	0.73	4.00	0.84	0.20	1.05	200	2.52	52.09	1.66	110.0	86.200	86.000	-0.20	82.850	82.650	3.1	81.800	82.850	1.05	80.075	79.875	2.8	EXISTING SEWER
	130	128	36	0.51	4263	73.62	3.31	57.13	20.61	77.75	450	0.20	127.49	0.80	96.2	81.800	82.850	1.05	80.125	79.675	2.7	80.900	81.980	1.08	79.933	79.483	2.0	EXISTING SEWER
	128	4	32	0.54	4295	74.16	3.31	57.51	20.76	78.28	450	0.17	117.54	0.74	62.8	80.900	81.980	1.08	79.903	79.453	2.1	82.100	82.150	0.05	79.796	79.346	2.4	EXISTING SEWER
Phases 1, 2, 3, 4w, 5, 6, 7, 8, 9 based on 4 pers/unit (Point B)	4	36	2924	48.60	7219	122.76	3.09	90.47	34.37	124.84	600	0.10	194.16	0.69														
Minto Lands West of Hydro Easement based on 4 pers/unit (Point A)		36	2244	23.36	2244	23.36	3.55	32.24	6.54	38.78																		
Total for Morgan's Grant Subdivision north of Terry Fox Drive (4 pers/unit) to Hines Rd San. sewer (Points A & B)	36				9463	146.12	2.98	114.18	40.91	155.09																		
Total for Morgan's Grant Subdivision north of Terry Fox Drive (3.05 pers/unit) to Hines Rd San. sewer (Points A & B)	36				7216	146.12	3.09	90.43	40.91	131.35																		
Comm (2.15 ha) + Res (27.0 ha)	122	121	24	0.38	24	0.38	4.00	0.39	0.11	0.50	200	3.78	63.76	2.03	63.5	83.500	84.450	0.95	80.400	80.200	4.0	80.900	81.820	0.92	78.000	77.800	3.8	
	121	120	24	0.28	48	0.66	4.00	0.78	0.18	0.96	200	2.53	52.17	1.66	68.0	80.900	81.820	0.92	77.900	77.700	3.9	79.400	80.270	0.87	76.179	75.979	4.1	
	120	117	328	32.68	1872	33.34	3.61	27.36	9.34	36.70	300	0.40	61.15	0.87	69.5	79.400	80.270	0.87	75.479	75.179	4.8	79.400	80.400	1.00	75.201	74.901	5.2	
	116	119	8	0.14	8	0.14	4.00	0.13	0.04	0.17	200	2.00	46.38	1.48	8.1	82.100	83.340	1.24	79.262	79.062	4.1	82.100	83.300	1.20	79.100	78.900	4.2	
	119	118	24	0.22	32	0.36	4.00	0.52	0.10	0.62	200	2.69	53.78	1.71	37.2	82.100	83.300	1.20	79.000	78.800	4.3	81.550	82.320	0.77	78.000	77.800	4.3	
	118	117	44	0.50	76	0.86	4.00	1.23	0.24	1.47	200	2.21	48.75	1.55	81.1	81.550	82.320	0.77	77.700	77.500	4.6	79.400	80.400	1.00	75.908	75.708	4.5	
	117	110	24	0.31	1972	34.51	3.59	28.68	9.66	38.35	300	0.40	61.15	0.87	70.3	79.400	80.400	1.00	75.201	74.901	5.2	79.600	80.800	1.20	74.920	74.620	5.9	
	111	110	12	0.33	12	12.00	4.00	0.19	3.36	3.55	200	1.91	45.32	1.44	46.0	80.300	81.250	0.95	76.500	76.300	4.8	79.600	80.800	1.20	75.620	75.420	5.2	
	110	109	16	0.30	2000	46.81	3.59	29.05	13.11	42.16	300	0.40	61.15	0.87	66.0	79.600	80.800	1.20	74.920	74.620	5.9	79.900	80.800	0.90	74.656	74.356	6.1	
	115	114	20	0.32	20	0.32	4.00	0.32	0.09	0.41	200	4.49	69.51	2.21	51.2	84.850	85.450	0.60	81.500	81.300	4.0	82.500	83.500	1.00	79.200	79.000	4.3	
	116	114	20	0.30	20	0.30	4.00	0.32	0.08	0.41	200	0.58	21.98	0.80	64.5	83.100	83.340	1.24	79.374	79.174	4.0	82.500	83.500	1.00	79.000	78.800	4.5	

Peak Sewage Flow from Phase 12
= 36.70-0.50-0.96 = 35.24 L/sec

Total from Morgan's Grant Phase 12

1496 POP. 27.0ha

444 POP. 10.1Ha

958 POP. 16.0ha

124 POP. 2.92ha

INCLUDED IN PHASE 8

INCLUDED IN KLONDIKE RD FLOWS

PHASE 11

PHASE 8

PHASE 7

PHASE 6

PARK

PART 1 4R-13628

PART 3

OTHER OWNER CORPORATION OF THE TOWNSHIP OF GOULBOURN PIN 04328-0212

OTHER OWNER GARY & HOWARD PIN 04328-0213

OTHER OWNER PATRICK & CLARENCE PIN 04328-0215

OTHER OWNER BLOOM & BARRY PIN 04328-0011

1496 POP. 30.2ha

901 POP. 9.91ha

682 POP. 15.0ha

496 POP. 7.24ha

MINTO LANDS

2.15 ha COMMERCIAL AT 50 000 l/ha/day

2.18 0.70

0.50 0.70

0.57ha (comm.) AT 50 000 l/ha/day

INCLUDED IN KLONDIKE RD FLOWS

OTHER OWNER MARIANNE ANN PIN 04477-0267 PLAN 4R-11017

INCLUDED IN PHASE 9

PHASE 9

PHASE 5C

PHASE 5B

BLOCK 225 (PARK)

BLOCK 224 (SCHOOL)

144 POP. 2.48ha

PHASE 5A

PHASE 4 EAST

PHASE 3

PHASE 4 WEST

POINT C

HYDRO EASEMENT

ROAD ALLOWANCE BETWEEN CONCESSIONS 2 AND 3

MINTO LANDS

1295 POP. 17.44ha

1196 POP. 16.8ha

PHASE 2

PHASE 1

2244 POP. 23.36ha

FUTURE SANITARY FLOWS TO GO TO HINES RD. SANITARY SEWER VIA T. FOX DRIVE

POINT A

1228 POP. 30.1ha

7219 POP. 122.78ha

POINT B

CARP FORCEMAIN (08 I/s)

MORGAN'S GRANT SANITARY FLOWS AND CARP FORCEMAIN FLOWS TO HINES RD SANITARY SEWER VIA TRILLIUM EASEMENT.

TERRY FOX DRIVE

				6	02/01/01	REVISED PER PHASE 6, 7 & 8	D.S.
				5	10/11/00	REVISED PER PHASE 9	D.S.
				4	03/10/00	REVISED PER ROC	D.S.
				3	31/07/00	ISSUED FOR APPROVAL–PH. 5B	D.S.
				2	22/06/00	REVISED PHASE 6,7,8 AND 9	D.S.
7	29/01/01	KNUEA ADDED	D.S.	1	15/02/00	ISSUED FOR APPROVAL–PH.5C	D.S.

REGISTERED PROFESSIONAL ENGINEER D. G. SHILLINGTON 2/02/01 PROVINCE OF ONTARIO

SCALE

0 25m 50m 75m 100m

HORIZONTAL 1:3000

J.L.Richards & Associates Limited

Consulting Engineers, Architect & Planners

OTTAWA, KINGSTON, SUDBURY, CANADA.

DESIGN

CHECKED D.S.

DRAWN WF/TS

CHECKED

APPROVED

CITY OF KANATA

DEPARTMENT OF ENGINEERING AND PUBLIC WORKS

minto

MORGAN'S GRANT SUBDIVISION

MASTER DRAINAGE PLAN (SANITARY)

DATED NOV. 1999

DWG. No. 1608701–SA1

2.0 SANITARY SEWAGE

2.1 Existing Sanitary Systems

Sanitary sewage generated from the Morgan's Grant Subdivision is conveyed to the following two sanitary sewer outlets:

1) a 375 mm dia. sanitary sewer flowing easterly across March Road approximately 200 m north of Morgan's Grant Way, which eventually outlets into the East March Trunk Sewer; and

2) a 600 mm dia. sanitary sewer crossing Terry Fox Drive approximately 200 m west of March Road, which outlets to the Hines Road sanitary sewer.

The 375 mm dia. sewer collects sanitary sewage from approximately 65 ha, of which Morgan's Grant accounts for approximately 29 ha. This outlet collects sewage for most of Morgan's Grant Phase 4, the commercial area located north of Morgan's Grant Phase 4, and approximately 36 ha of land located north of Morgan's Grant Phase 6. (i.e. KNUEA)

The 600 mm dia. sewer collects sanitary sewage for approximately 125 ha. This outlet collects sewage from all areas included in Morgan's Grant Phases 1, 2 and 3, the westerly portion of Morgan's Grant Phase 4, all areas included in Morgan's Grant Phases 5, 6, 7, 8 and 9 and some of the lands west of the hydro easement adjacent to Klondike Road. This 600 mm dia. Sanitary sewer will also collect sewage from the remainder of the Morgan's Grant lands, west of the hydro easement, via a future sanitary sewer down Terry Fox Drive.

2.2 Sanitary Flows

The design of local sanitary sewers is summarized in the following table (peaking factors for each are shown in parentheses):

Land Use	Sanitary Flow Contribution		
	L/cap/day	L/ha/day	L/s/ha
Residential	350 (Harmon)		
Commercial		50,000 (1.5)	
Institutional		50,000 (1.5)	
Infiltration			0.28 (1.0)

The Harmon peaking factor was calculated for each pipe reach to determine the sanitary peak flows in residential development areas. This peaking factor provides an increased peaking factor for smaller urban areas over larger developments. The following formula is used to derive the Harmon peaking factor:

$$\text{Harmon} = 1 + \frac{14}{(4 + P^{1/2})}$$

A 1.5 peaking factor was utilized for land uses other than residential areas (i.e. institutional, commercial etc.). Sanitary flows estimated with the above information were calculated on the conservative assumption that sanitary peak flows occurred simultaneously.

For purposes of designing flows in local sanitary sewers within the Morgan's Grant Plan of Subdivision, the standard of four persons per unit was used. This results in flows of 38.78 L/s, 125.05 L/s and 49.51 L/s at Points A, B and C on the enclosed Master Drainage Plan (see also enclosed Sanitary Sewer Design Sheet).

Flows from Point A will be conveyed via a future sanitary sewer down Terry Fox Drive to Point B, where flows from Points A and B are combined with the Village of Carp forcemain flows which then travel south through the Trillium easement to the upper end of the Hines Road sewer.

At Terry Fox Drive, the flows from the Morgan's Grant Subdivision are based on 3.05 persons per unit, for consistency with the Region of Ottawa-Carleton Wastewater Master Plan which results in a flow of 131.52 L/s. The Region has advised that, at this point, allowable sanitary flows are as follows:

Morgan's Grant Subdivision	136 L/s	
Village of Carp Forcemain	58 L/s	
	194 L/s	(i.e. 600 mm dia. sanitary at 0.1% has a capacity of 194 L/s)

Sanitary flow from Point C leaving the subdivision, result in projected flows of 49.51 L/s (see enclosed Sanitary Sewer Design Sheet).

The capacity of this sewer crossing under March Road is 96.02 L/s (i.e. 375 mm sanitary at 0.30%).

2.3 Summary

The proposed sanitary sewer servicing scheme has been developed to accommodate all the lands within the boundaries of Morgan's Grant Subdivision as well as the recently acquired KNUEA lands and the Sanitary Sewer Design Sheets demonstrate that all sanitary sewer flows are within the allocations provided by the City of Ottawa (i.e. City of Kanata, Region of Ottawa Carleton)

Ontario

Ministry of the Environment **Ministère de l'Environnement**

CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 4208-6J7J5T
Issue Date: November 17, 2005

Minto Developments Inc.
427 Laurier Avenue West, No. 300
Ottawa, Ontario
K1R 7Y2

Site Location: Morgan's Grant Subdivision Stage 12D
Part of Lots 11 and 12, Concession 3
Ottawa City, Ontario

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

storm and sanitary sewers to be constructed in the City of Ottawa on Ishpatina Crescent, Goward Drive, and Finlayson Crescent, all in accordance with the application from Minto Developments Inc., dated May 11th, 2005, including final plans and specifications prepared by J.L. Richards & Associates Limited

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
2300 Yonge St., 12th Floor
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

The Director
Section 53, *Ontario Water Resources Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 17th day of November, 2005

Aziz Ahmed, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

EC/
c: District Manager, MOE Ottawa
Robert L. Phillips, C.E.T., Program Manager,
Infrastructure Approvals West, City of Ottawa
Lee Jablonski, P.Eng., J.L. Richards & Associates Limited

Ontario

Ministry of the Environment **Ministère de l'Environnement**

CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 8692-54QSUG

Minto Developments Inc.
427 Laurier Avenue West, Suite 300
Ottawa, Ontario
K1R 7Y2

Site Location: Morgan's Grant
Part of Lot 11, Concession 3
Ottawa City,

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

Stormwater management facility to be located in the southern quadrant of the intersection Old Carp Road and March Road in the City of Ottawa as follows:

- a 5.7 metre, 1500 millimetre diameter inlet sewer discharging into the first chamber of a splitter box;
- a splitter box divided into two(2) chambers, containing: a weir in the first chamber, directing the runoff to the sediment forebay; a weir in the second chamber with its crest 0.5 m above the crest elevation in the first chamber, directing run off to the wet cell via an overflow pipe; a spillway with its invert elevation elevation 0.8 m higher than the crest elevation in the first chamber, directing runoff to the wet cell;
- a sediment forebay with an average depth of 1.3 metres, an average width of 24 metres and a length of 82 metres discharging treated runoff to the wet cell via a weir with the crest at the same level as the weir crest in the first chamber;
- a wet cell consisting of a permanent pool volume of 10,250 cubic metres and an active storage of 13,000 cubic metres and an outlet structure containing a weir with crest elevation 3 metres lower than the weir crest in the first chamber of the splitter box; discharging treated runoff to an existing municipal drain via an approximately 150 metres,1650 millimetre diameter outlet storm sewer running along March Road;

all in accordance with the application from Minto Developments Inc. dated August 14 2001, including design brief, final plans, specifications and other supporting documents prepared by Cumming Cockburn Limited

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

"certificate" means this entire certificate of approval document, issued in accordance with Section 53 of the *Ontario Water Resources Act*, and includes any schedules;
"Director" means any Ministry employee appointed by the Minister pursuant to section 5 of the *Ontario Water Resources Act*;
"District Manager" means the District Manager of the Ottawa District Office of the Ministry;
"Environmental Appeal Board" means the Environmental Review Tribunal established pursuant to the Environmental Review Tribunal Act;
"Ministry" means the Ontario Ministry of the Environment;
"Owner" means Minto Developments Inc. and includes its successors and assignees;
"works" means the sewage works described in the Owner's application, this certificate and in the supporting documentation referred to herein, to the extent approved by this certificate;
" grab sample " means an individual representative sample of sewage collected in acordance with Section 3.1.1 of the Ministry's publication entitled "Protocol for the Sampling and Analysis of Industrial/Municipal Waste Water", dated January 1999, and as amended from time to time;

You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL CONDITION

(a) Except as otherwise provided by these Conditions, the Owner shall design, build, install, operate and maintain the works in accordance with the description given in this Certificate, the application for approval of the works and the submitted supporting documents and plans and specifications as listed in this Certificate.

(b) Where there is a conflict between a provision of any submitted document referred to in this Certificate and the Conditions of this Certificate, the Conditions in this Certificate shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

2. EFFLUENT MONITORING AND RECORDING

The Owner shall, establish and carry out , upon commencement of operation of the sewage works, the following monitoring program:

(a) In a given calendar year, at least five rainfall events shall be selected during the period from the beginning of May to the end of September of that year and for each event, composite samples shall be constituted from three (3) grab samples of the storm run off at the inlet to the pond before it discharges to the sediment forebay and four (4) grab samples of the effluent leaving the pond at the outlet structure at approximately 1,2,4,6 and 8 hours from the start of each rainfall event and, the composite samples shall be analyzed for the Total Suspended Solids

(b) The sampling and analyses required in subsection (1) shall be performed in accordance with the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" January 1999 and as amended; or as described in the American Public Health Association's publication " Standard Methods for Examination of Water and Wastewater", 20th Edition, 1998 and as amended;

(c) Pursuant to subsections (1) and (2) the owner shall prepare and submit in writing a monitoring report to the District Manager by the 31st day of October immediately following the monitoring period and which shall include, as a minimum, results of the water quality monitoring program, the stage curve for the outlet weir - validated in the course of the monitoring period - the hyetographs and outlet hydrographs for the storms associated with the said water quality analyses and, an assessment of the facility's performance;

(d) The monitoring program described in subsections (1), (2) and (3) shall begin when approximately 80 % of the land mass tributary to the sewage works have been developed. After its inception, the said monitoring program shall last for a period of no less than
three (3) consecutive years.

3. The Owner shall make all necessary investigations, take all necessary steps and obtain all necessary approvals so as to ensure that the physical structure, siting and operations of the stormwater works do not constitute a safety or health hazard to the general public.

4. The Owner shall ensure that sediment and excessive decaying vegetation are removed from the above noted stormwater management system at such a frequency as to prevent the excessive buildup and potential overflow of sediment and/or decaying vegetation into the receiving watercourse.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the works are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the Certificate and the practice that the Certificate is based on the most current document, if several conflicting documents are submitted for review.

2. Condition No. 2 is included to ensure that the information relating to the operation of the sewage works is made available to Shirley's Brook.

3. Condition 3 is imposed because it is not in the public interest for the Director to approve facilities which, by reason of potential health and safety hazards do not generally comply with legal standards or approval requirements falling outside the purview of this Ministry.

4. Condition 4 is included as regular removal of sediment and excessive decaying vegetation from this approved stormwater management system are required to mitigate the impact of sediment and/or decaying vegetation on the downstream receiving watercourse. It is also required to ensure that adequate storage is maintained in the stormwater management facilities at all times as required by the design.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
2300 Yonge St., 12th Floor
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

The Director
Section 53, *Ontario Water Resources Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 21st day of December, 2001

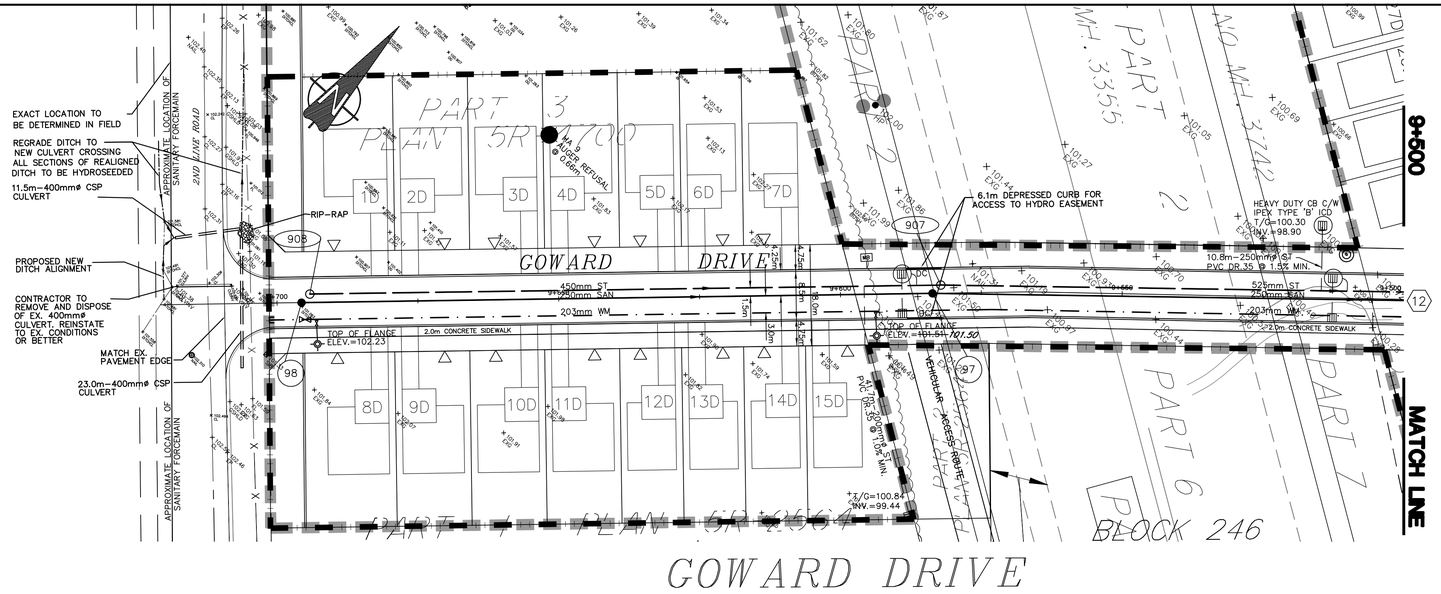
Mohamed Dhalla, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

SK/
c: District Manager, MOE Ottawa
Peter Spal, Cuming Cockburn Limited

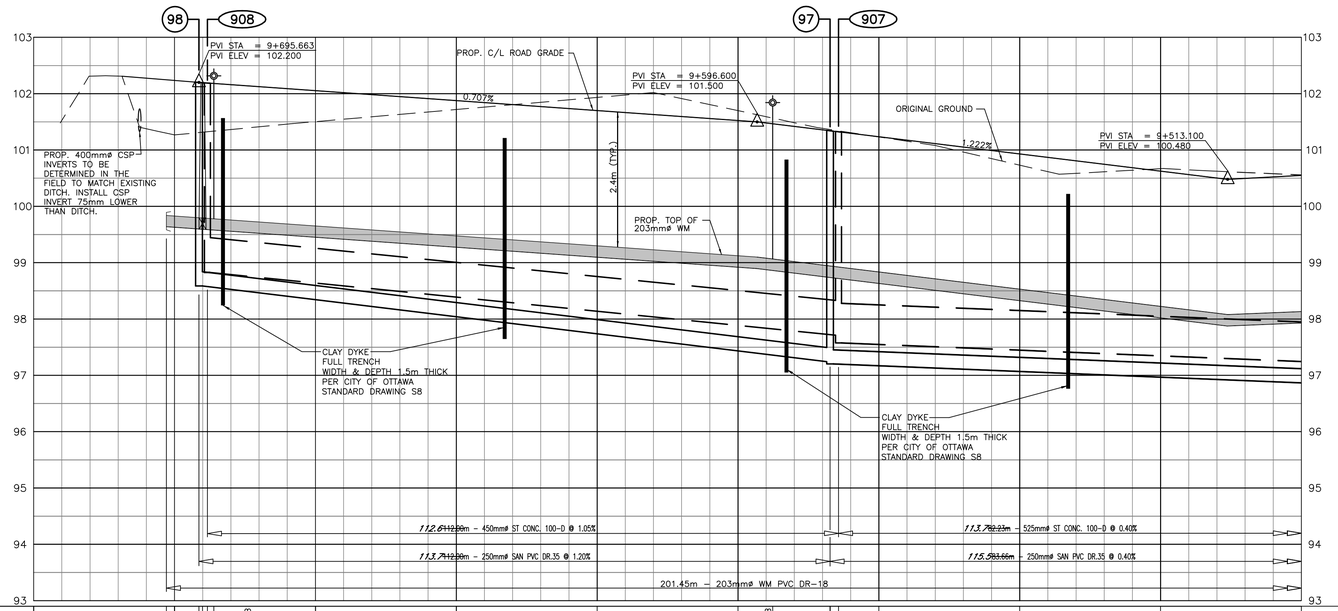
LEGEND

- EXISTING CATCH BASIN
- PROPOSED CATCH BASIN
- INTERCONNECTED ROADWAY CB C/W ONE 19.8L/S IPEX TYPE 'A' ICD OR CITY APPROVED EQUIVALENT
- CATCH BASIN WITH INDIVIDUAL 19.8 L/S IPEX TYPE 'A' ICD OR CITY APPROVED EQUIVALENT
- PROPOSED CATCH BASIN / MANHOLE
- PROPOSED CATCH BASIN FOR LANDSCAPED AREAS
- PROPOSED WATERMAIN, VALVE & HYDRANT
- EXISTING WATERMAIN, VALVE & HYDRANT
- WATERMAIN VALVE AND VALVE CHAMBER
- WATERMAIN VALVE AND VALVE BOX
- EXISTING SANITARY SEWER & MANHOLE
- EXISTING STORM SEWER & MANHOLE
- PROPOSED SANITARY SEWER & MANHOLE
- PROPOSED STORM SEWER & MANHOLE
- PROPOSED CATCH BASIN & LEAD
- 30C — LOT NUMBER
- 2.0m CONC. CURB AND SIDEWALK
- DC — DEPRESSED CURB
- SILT FENCE (OPSD 249.110)
- PHASING LIMIT
- (2) — DRAWING NUMBER
- TP 4, 81.07 ROCK — TEST PIT SHOWING ELEVATION OF ROCK
- HA 1, AUGER REFUSAL 0.3m DEPTH — HAND AUGER HOLE LOCATION SHOWING DEPTH FROM EXISTING GROUND SURFACE TO REFUSAL (INFERED DEPTH TO BEDROCK)

ALL MANHOLES TO BE 1200mmø UNLESS SHOWN OTHERWISE



GOWARD DRIVE



DESIGN PROFILE ELEVATIONS			102.199	102.054	101.877	101.701	101.524	101.236	100.931	100.625	100.549
W.M. TOP ELEVATIONS	WM CAP ~~99.330~~ 98.880	~~98.75~~ 98.60	VALVE & VB ~~98.75~~ 98.60	HYDRANT, VALVE & VB ~~98.75~~ 98.60	~~98.754~~ 98.61	~~98.577~~ 98.48	~~98.401~~ 98.23	~~98.324~~ 98.22 HYDRANT, VALVE & VB ~~98.497~~ 98.67	~~98.236~~ 98.84	~~98.531~~ 98.51	~~98.325~~ 98.26	~~98.15~~ 98.140
STORM SEWER INV. ELEVATION				~~98.01~~ 97.910				~~97.52~~ 97.420 ~~97.420~~ 97.320 ~~97.320~~ 97.143				
SANITARY SEWER INV. ELEVATION		~~98.49~~ 98.390	~~98.390~~ 98.290	~~98.290~~ 98.190				~~97.16~~ 97.060 ~~97.060~~ 96.960 ~~96.960~~ 97.12				
C.L. ROADWAY STATION	9+725	9+701.450	9+701.663	9+695.030	9+694.185	9+693.030	9+675	9+650	9+625	9+600	9+593.840	9+583.658	9+582.160	9+575	9+550	9+525	9+500

DESIGN PROFILE ELEVATIONS			102.199	102.054	101.877	101.701	101.524	101.236	100.931	100.625	100.549
W.M. TOP ELEVATIONS	WM CAP ~~99.330~~ 98.880	~~98.75~~ 98.60	VALVE & VB ~~98.75~~ 98.60	HYDRANT, VALVE & VB ~~98.75~~ 98.60	~~98.754~~ 98.61	~~98.577~~ 98.48	~~98.401~~ 98.23	~~98.324~~ 98.22 HYDRANT, VALVE & VB ~~98.497~~ 98.67	~~98.236~~ 98.84	~~98.531~~ 98.51	~~98.325~~ 98.26	~~98.15~~ 98.140
STORM SEWER INV. ELEVATION				~~98.01~~ 97.910				~~97.52~~ 97.420 ~~97.420~~ 97.320 ~~97.320~~ 97.143				
SANITARY SEWER INV. ELEVATION		~~98.49~~ 98.390	~~98.390~~ 98.290	~~98.290~~ 98.190				~~97.16~~ 97.060 ~~97.060~~ 96.960 ~~96.960~~ 97.12				
C.L. ROADWAY STATION	9+725	9+701.450	9+701.663	9+695.030	9+694.185	9+693.030	9+675	9+650	9+625	9+600	9+593.840	9+583.658	9+582.160	9+575	9+550	9+525	9+500

RECORD DRAWING
PRODUCED FROM INFORMATION PROVIDED BY FIELD INSPECTOR
date: MAY 03, 2013
J.L. RICHARDS & ASSOCIATES LIMITED

NOTES:

1. INSTALL CLAY DYKES AT 50m INTERVALS BEGINNING AT THE LOW END OF THE SEWERS AND PROCEEDING UPSTREAM FOR EACH OF THE THREE STREETS SERVICED. EACH CLAY DYKE SHALL BE CONSTRUCTED OF CLAY GEOTECHNICAL MATERIAL AND PLACED THE FULL HEIGHT AND WIDTH OF THE TRENCH AND BE 1.5m THICK.

W:\17732\07\PHASE 12D\17732 C 12 13.dwg

				6	02/05/13	RECORD DRAWING	L.J.
				5	24/11/05	ISSUED FOR CONSTRUCTION	L.J.
				4	18/10/05	REVISED PER HYDRO ONE COMMENTS	L.J.
				3	11/07/05	REVISED PER CITY COMMENTS	L.J.
				2	11/05/05	ISSUED FOR MOE APPROVAL	L.J.
				1	15/04/05	ISSUED TO BLASTING CONTRACTOR	L.J.

SCALE
HORIZONTAL 1:500
0 5m 10m 15m 20m
0 1m 2m
VERTICAL 1:50

J.L.Richards
ENGINEERS·ARCHITECTS·PLANNERS
J.L. Richards & Associates Limited
864 Lady Ellen Place
Ottawa, ON Canada
K1Z 5M2
Tel: 613 728 3571
Fax: 613 728 6012

DESIGN	J.B.
CHECKED	L.J.
DRAWN	M.B.
CHECKED	
APPROVED	

Ottawa

minto

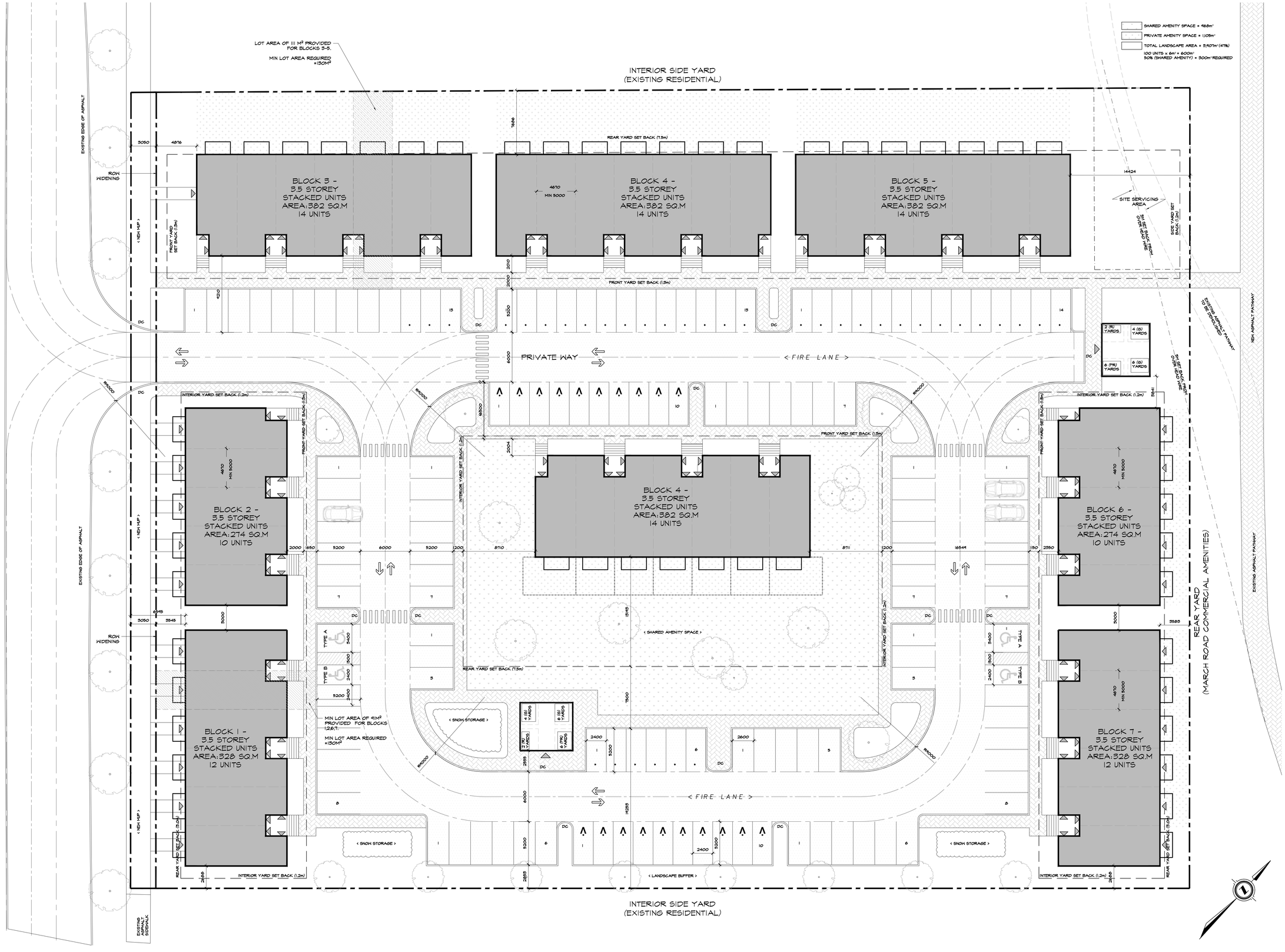
MORGAN'S GRANT
PHASE 12D
GOWARD DRIVE
PLAN & PROFILE
FROM STA. 9+500.00 TO STA. 9+695.66

DATED APRIL 2005
DWG. No. 17732–13

Appendix J – Drawings

Site Plan Drawing

Survey Plan



CLIENT NAME:

THEBERGE HOMES

NOTES:

1) ALL WORK TO BE IN COMPLIANCE WITH LOCAL BUILDING CODES, REGULATIONS AND BY-LAWS.

2) ADDITIONAL DRAWINGS MAY BE ISSUED FOR CLARIFICATION TO ASSIST PROPER EXECUTION OF WORK. SUCH DRAWINGS WILL HAVE THE SAME MEANING AND INTENT AS IF THEY WERE INCLUDED WITH PLANS IN CONTRACT DOCUMENTS.

3) DO NOT SCALE DRAWINGS.

4) ALL SUB-CONTRACTORS TO TAKE THEIR OWN ON-SITE MEASUREMENTS AND BE RESPONSIBLE FOR THEIR ACCURACY

5) NOTIFY SHAWN J. LAWRENCE ARCHITECT FOR ANY ERRORS AND/OR OMISSIONS PRIOR TO START OF WORK.

UNIT COUNT

STACKED TOWNS: 100 UNITS

TOTAL UNIT COUNT: 100

TOTAL PARKING

PARKING SPACES REQUIRED: 1.2 PER UNIT
VISITOR SPACES REQUIRED: 0.2 PER UNIT
40% OF PARKING ALLOWED TO BE REDUCED SIZE (4.6mx2.4m)

TOTAL SPACES REQUIRED: 140 SPACES (20 REQUIRED TO BE VISITOR PARKING)

SPACES PROVIDED: 140

-20 VISITOR
-4 ACCESSIBLE SPACES
-56 REDUCED SIZED SPACES

WASTE MANAGEMENT

GARBAGE 0.231 YARDS PER UNIT
RECYCLING (FIBRE) 0.062 YARDS PER UNIT
RECYCLING (6MP) 0.018 YARDS PER UNIT

GARBAGE: 24 YARDS REQUIRED
RECYCLING (FIBRE): 7 YARDS REQUIRED
RECYCLING (6MP): 2 YARDS REQUIRED

SEAL:

NORTH ARROW:

No.	DATE	REVISION
08	2023.03.20	RE-ISSUED FOR PRE-CONSULT
07	2023.03.14	ISSUED FOR REVIEW
06	2023.02.22	RE-ISSUED FOR PRE-CONSULT
05	2023.02.14	ISSUED FOR REVIEW
04	2023.01.19	ISSUED FOR REVIEW
03	2022.11.22	ISSUED FOR PRE-CONSULT
02	2022.11.18	ISSUED FOR REVIEW
01	2022.11.09	ISSUED FOR REVIEW

S.J.LAWRENCE ARCHITECT INCORPORATED
18 DEAKIN STREET
SUITE 209
OTTAWA, ONTARIO
K2E 8B7
T: (613) 734.7770
F: (613) 734.7103
sjl@sjlarchitect.com

LAWRENCE ARCHITECT INCORPORATED

PROJECT:
OLD SECOND LINE DEVELOPMENT
1150 OLD SECOND LINE ROAD, OTTAWA, ON

SHEET TITLE:
CONCEPT SITE PLAN OPTION 03 (100 UNITS)

DRAWN BY: D.T.	CHECKED BY: B.L. S.J.L.
PLOT DATE: 2023.03.20	PROJECT DATE: DATE
JOB NUMBER: SL-1086-22	SCALE: 1:200

SHEET NUMBER:

A1.2

PLAN #

APPLICATION #

347999, 5023393

TOPOGRAPHIC PLAN OF SURVEY OF

PART OF LOT 11
CONCESSION 3
GEOGRAPHIC TOWNSHIP OF MARCH
CITY OF OTTAWA

FARLEY, SMITH & DENIS SURVEYING LTD. 2018

Scale 1: 200

0 2.5 5 10 15 20 metres

Metric Note
Distances and coordinates on this plan are in metres and can be converted to feet by dividing by 0.3048.

Distance Note
Distances shown on this plan are ground distances and can be converted to grid distances by multiplying by the combined scale factor of 0.99991.

Bearing Note
Bearings are grid and are referred to the easterly limit of Second Line Road having a bearing of N 42° 13' 50" W as shown on Registered Plan 4M-1309 and are referred to the Central Meridian of MTM Zone 9 (76°30' West Longitude) Nad-83 (Original).

Elevation Notes
1. Elevations shown are geodetic and are referred to Geodetic Datum CGVD-1928 :1978.
2. It is the responsibility of the user of this information to verify that the job benchmark has not been altered or disturbed and that it's relative elevation and description agrees with the information shown on this drawing.

Utility Notes
1. This drawing cannot be accepted as acknowledging all of the utilities and it will be the responsibility of the user to contact the respective utility authorities for confirmation.
2. Only visible surface utilities were located.
3. Underground utility data derived from City of Ottawa utility sheet reference:A-N-20.
4. Sanitary and storm sewer grades were derived from field measurement.
5. A field location of underground plant by the pertinent utility authority is mandatory before any work involving breaking ground, probing, excavating etc.

Note
Trees located within 5m corridor of subject boundary only.

Notes & Legend

○—	Denotes	Survey Monument Planted
■—	"	Survey Monument Found
SIB	"	Standard Iron Bar
SSIB	"	Short Standard Iron Bar
IB	"	Iron Bar
(WR)	"	Witness
Meas	"	Measured
(P1)	"	Plan 4R-26462
(P2)	"	Registered Plan 4M-1309
(P3)	"	Registered Plan 4M-1345
(P4)	"	Plan 4R-20110
(P5)	"	Plan 5R-1715
MH-ST	"	Maintenance Hole (Storm)
MH-S	"	Maintenance Hole (Sanitary)
ST	"	Underground Storm Sewer
S	"	Underground Sanitary Sewer
W	"	Underground Water
P	"	Underground Electrical
OHW	"	Overhead Wires
○UP	"	Utility Pole
○ AN	"	Anchor
□DI	"	Ditch Inlet
CSP	"	Corrugated Steel Pipe
FH	"	Fire Hydrant
Inv.	"	Invert
T/G	"	Top of Grate
T/P	"	Top of Pipe
BH	"	Borehole
Ø	"	Diameter
CLF	"	Chain Link Fence
PWF	"	Post and Wire Fence
BF	"	Board Fence
SBF	"	Sound Barrier Fence
SRW	"	Irregular Stone Retaining Wall
WRW	"	Wood Retaining Wall
RF	"	Rail Fence
C/L	"	Centreline
NF	"	North Face
CH	"	Cedar Hedge
tow	"	Top of Wall
U/S	"	Underside
U/Eave	"	Underside of Eave
EOG	"	Edge of Gravel
TpFdn	"	Top of Foundation
Elev	"	Elevation
+65.00	"	Location of Elevations
+65.00	"	Top of Concrete Curb Elevation
	"	Property Line
	"	Deciduous Tree
	"	Coniferous Tree

ASSOCIATION OF ONTARIO LAND SURVEYORS
PLAN SUBMISSION FORM
2039786

THIS PLAN IS NOT VALID UNLESS IT IS AN EMBOSSED ORIGINAL COPY
SEALED BY THE SURVEYOR
In accordance with Regulation 1026, Section 29 (3).

Surveyor's Certificate
I certify that :
1. This survey and plan are correct and in accordance with the Surveys Act, the Surveyors Act and the Regulations made under them.
2. The survey was completed on the 28th day of February, 2018.

03/30/18
Date

Jamie Leslie
Ontario Land Surveyor

TOPOGRAPHIC DATA WAS COLLECTED UNDER WINTER CONDITIONS. SNOW COVER AND ICE PRECLUDE DETERMINING LOCATION AND ELEVATION OF SOME TOPOGRAPHICAL DATA THAT IS OTHERWISE VISIBLE.

FARLEY, SMITH & DENIS SURVEYING LTD.
ONTARIO LAND SURVEYORS
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